STATE OF ILLINOIS

Environmental Protection Agency

Project 2010300074

Rockford Groundwater Contamination
Final Operable Unit Project Plans

Rockford,Illinois
Winnebago County

PLAN
H and SAFETY PLAN
ΓY ASSURANCE PROJECT PLAN
.ING and ANALYSIS PLAN
UNITY RELATION PLAN

COPY

CDM
environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.

200 West Adams Street, Suite 1600
Chicago, Illinois 60606
312 786-1313

June 6, 1990

Mr. David Dollins
Illinois Environmental Protection Agency
Division of Land Pollution Control
Remedial Project Management Section
Federal Site Management Unit
2200 Churchill Road
Springfield, Illinois 62794-9276

Dear Mr. Dollins:

Camp Dresser & McKee Inc. (CDM) is pleased to submit twenty copies of the Final Project Plans for the Southeast Rockford Operable Unit Study for your files. This package includes the Work Plan, Quality Assurance Project Plan, Sampling and Analysis Plan, Health and Safety Plan and Community Relations Plan. Five copies of these documents have also been submitted to Ms. Karen Vendl, the USEPA Remedial Project Manager, through Ms. Karen Yeates for their files.

If you have any questions regarding this submittal, please do not hesitate to call.

Very truly yours,

CAMP DRESSER & McKEE INC.

Jun Yoshitani, P.E
Vice President

JY:st

Enclosures

10510/104

CDM
environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.

200 West Adams Street, Suite 1600
Chicago, Illinois 60606
312 786-1313

June 6, 1990

Ms. Karen Yeates
Illinois Project Officer
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Ms. Yeates:

At the request of Mr. David Dollins, the Illinois EPA Project Manager for the Southeast Rockford Project, Camp Dresser & McKee Inc. (CDM) is pleased to submit five copies of the Final Project Plans for the Southeast Rockford Operable Unit Study for your files. This package includes the Work Plan, Quality Assurance Project Plan, Sampling and Analysis Plan, Health and Safety Plan and Community Relations Plan.

If you have any questions regarding this submittal, please do not hesitate to call.

Very truly yours,

CAMP DRESSER & McKEE INC.

Jun Yoshitani, P.E.
Vice President

JY:st

Enclosures

10510/105

WORK PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION
OPERABLE UNIT FINAL WORK PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
REMEDIAL PROJECT MANAGEMENT SECTION
FEDERAL SITE MANAGEMENT UNIT
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

JUNE 1990

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1.0 INTRODUCTION

This Work Plan has been prepared to define the scope of activities required to perform a Remedial Investigation (RI) and Feasibility Study (FS) for an Operable Unit within the Southeast Rockford study area. The Work Plan addresses the requirements as described in the revised Statement of Work (SOW) dated August 29, 1989.

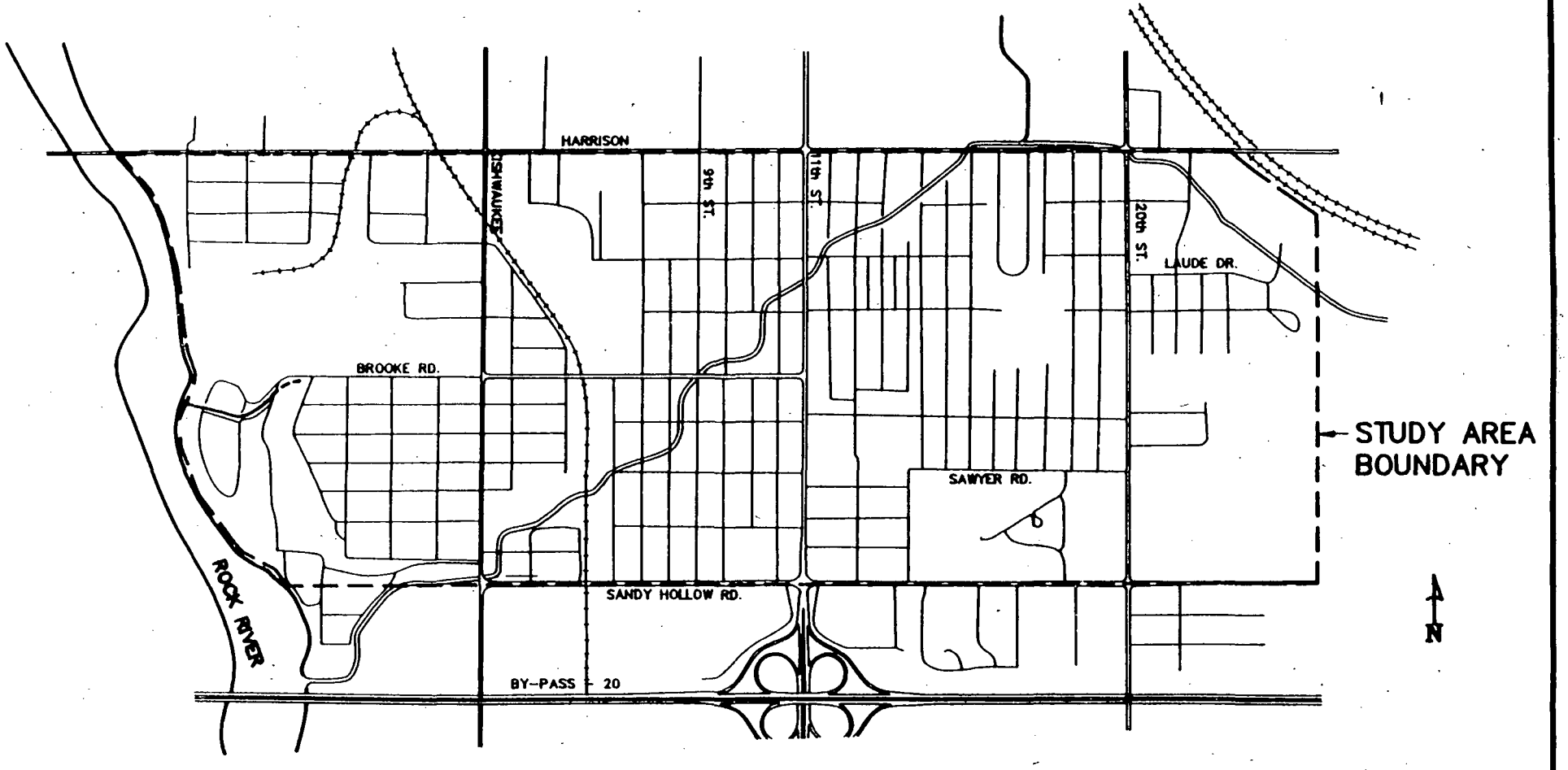
1.1 STUDY AREA LOCATION

The study area is located near Southeast Rockford in Winnebago County, and consists of approximately 2 to 3 square miles in Sections 1, 2, and 3, T43N, R1E and Section 6, T43N, R2E. The study area is bounded by Harrison Avenue to the north, Sandy Hollow Road to the south, the north-south center line of Section 6 to the east, and the Rock River to the west. The study area is shown in Figure 1-1.

The study area has been expanded westward, southward and eastward from the boundaries which were used to score the site for inclusion on the United States Environmental Protection Agency's (USEPA's) National Priorities List (NPL). The previous western boundary of the site was 8th Street, but the present study area extends west to the Rock River. The previous southern boundary was Sawyer Road, but the present study area extends south to Sandy Hollow Road. The previous eastern boundary of the site was 21st Street, but the present study area extends eastward to the north-south center line of Section 6.

1.2 STUDY AREA STATUS AND PROJECT TYPE

As a result of sampling events by state and federal agencies, the Southeast Rockford site was proposed for inclusion on the NPL in June 1988 and was added to the NPL in March 1989 as a state-lead, federally-funded Superfund site. The final removal action by USEPA includes extensions of water mains



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environmental engineers, scientists, planners, & management consultants

SCALE
0 0.5 MILES

SOUTHEAST ROCKFORD STUDY AREA

FIGURE NO.
1-1

and providing hookups to city water for residences and private wells contaminated with volatile organic compounds (VOCs) at levels greater than 25 percent of the Removal Action Limit (RAL). USEPA expects to begin construction of the water main extensions and residential hookups in June 1990. In addition to this operable unit study, the Illinois Environmental Protection Agency (IEPA) is currently in the planning stage of a phased RI/FS to more accurately assess the status of groundwater contamination in the study area and to delineate potential source areas.

1.3 WORK PLAN OVERVIEW

To achieve the objectives of the operable unit RI/FS, the following tasks have been identified:

- Compilation, evaluation, and analysis of information to determine the nature and extent of groundwater contamination;
- Assisting IEPA in conducting a well survey within the study area to define sampling locations and further identify those residences not connected to city water;
- Collection and analysis of groundwater samples necessary to determine the areas affected by the groundwater contamination;
- Evaluation of the current risks to public health from the contaminated groundwater;
- Preparation and submission of a Technical Memorandum discussing the results of the above tasks;
- Development of a limited number of alternatives for an initial Operable Unit on the basis of providing safe drinking water for affected residents;

- Screening of alternatives for feasibility and appropriateness;
- Management and analysis of treatability studies required to evaluate the applicability of remedial technologies (if necessary);
- Preparation of a detailed analysis of the alternatives that pass the initial feasibility and appropriateness screening;
- Evaluation and recommendation of cost-effective alternatives;
- Preparation and submission of a phased FS report discussing the results of the above tasks; and
- Submission of monthly Technical Progress Reports and Financial Management Reports.

1.4 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities for the Operable Unit RI/FS includes the collection and analysis of 204 samples: 155 of these samples are investigative, 17 are field duplicates, 17 are field blanks, and 15 are trip blanks. Only potable drinking water samples from residential, municipal, and industrial wells will be collected. The sampling and analysis program, including parameters that will be analyzed for and the number of quality control samples, is summarized in Table 1-1.

TABLE 1-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

			QA Samples									
			Investigative Samples			Field Duplicate			Field Blank			Matrix
Sample Matrix	Field Parameters	Laboratory Parameters	No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	Total
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	144	1	144	15	1	15	15	1	15	174
		SAS for metals[1/] from CLP	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	1	1	1	1	1	1	1	1	1	3
		SAS for metals[1/] from CLP	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	10	1	10	1	1	1	1	1	1	12
		SAS for metals[1/] from CLP	10	1	10	1	1	1	1	1	1	12

A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

1/ Compounds to be analyzed for are specified in the SAS request appended to the Quality Assurance Project Plan.

2.0 CURRENT STATUS OF STUDY AREA

Prior to planning the Operable Unit RI/FS, previous studies, available literature, and other pertinent information were reviewed. This section presents a summary of the review.

2.1 STUDY AREA DESCRIPTION

The study area is predominantly an urban residential area that includes scattered retail and commercial operations. A small industrial park is located near the eastern boundary of the study area in the vicinity of Laude Drive. The study area is predominantly flat-lying and slopes gently westward toward the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief across the study area is approximately 120 feet. A small concrete-lined drainage ditch runs across the study area and discharges to the Rock River near the southwestern corner of the study area.

A review of 117 Illinois Department of Public Health (IDPH) well construction reports indicates that the majority of the residential wells in the study area are screened in the 40-foot to 70-foot depth range in a sand and gravel aquifer. Although deeper residential wells are common in the study area, no systematic distribution of the deeper wells is evident. The information contained in the IDPH well construction reports is insufficiently detailed to characterize the hydrogeology of the site or to determine the well construction parameters for each of the private wells that will be sampled as a part of the Operable Unit investigation. To compensate for this deficiency in available information, the samplers will attempt to ascertain details of well construction in the field by questioning residents and by direct observation. The detailed hydrogeology of the study area will be addressed in the phased RI/FS for the site, which is a separate study that is currently in the planning stage.

2.2 GEOLOGICAL SETTING

The Southeast Rockford study area is situated over a valley train deposit that unconformably overlies Ordovician-aged bedrock. The valley train deposits are a complex sedimentary assemblage of unconsolidated sands, gravels, silts, clays, and tills that were deposited on the margins of the ancestral Rock River during various glacial events. These deposits are laterally discontinuous with complex stratigraphic relationships. Within the study area, the valley train deposit thickens to the west. In the vicinity of Harrison and Horton, the unconsolidated sediments are approximately 84 to 93 feet thick. The municipal well 35 at Ken Rock playground (2944 Bildahl Street) has a depth to bedrock of 214 feet.

The unconsolidated valley train sediments overlie an eroded bedrock surface of the Galena-Platteville Dolomite, the Glenwood Formation, and the St. Peter Sandstone. The St. Peter Sandstone is a major aquifer in Illinois. The Galena-Platteville and the Glenwood Formation pinch out to the west, so that at the Rock River, the valley train deposits directly overlie the St. Peter Sandstone.

2.3 STUDY AREA HISTORY

Groundwater contamination by volatile organic compounds (VOCs) was initially discovered by the City of Rockford in 1981. Four municipal wells in Southeast Rockford were taken out of service in December 1981 as a result of the contamination. In 1982, the city discovered that additional wells were contaminated and closed down more city wells. Contamination of Municipal Well 35, located near Ken Rock Playground, was discovered during a routine sampling of the well in 1984; the well was tested for 33 priority pollutants and several VOCs were detected.

Because contaminants were present at levels above the Safe Drinking Water Act Maximum Contaminant Level (MCL), the well was taken out of service in

1985. Subsequent analysis of a sample from this municipal well after disinfection with chlorine in 1989 indicated that none of the original contaminants were present above the level of detection; however, the analysis did show the presence of several trihalomethanes at low levels. These compounds are commonly associated with water disinfection and are not attributable to the groundwater contamination problem in the area. Trihalomethanes are regulated under the Safe Drinking Water Act, but do not warrant concern for this study because they were detected at levels significantly lower than the MCL.

IEPA discovered that VOCs were present in Southeast Rockford's water in 1984 as a result of a report that plating wastes were being illegally disposed of in a well located at 2613 South 11th Street. In October 1984, IDPH initiated an investigation that involved sampling 49 wells in the vicinity of the well. While the investigation did not find significant levels of contaminants common to plating wastes, it did report high levels of chlorinated solvents. These same contaminants were detected in the City of Rockford's municipal well. Further investigation by IDPH indicated extensive contamination in the area. By 1986, IDPH was able to define the contaminated area as approximately 1.2 square miles in Southeast Rockford, (the original study area boundaries). IDPH conducted four separate sampling investigations involving residential wells in the Southeast Rockford area: 49 samples were collected in 1984, 43 samples in 1985, 17 in 1988, and 267 in 1989. For the most part, well locations sampled varied during the separate sampling investigations; however, in some cases, wells were sampled more than once.

Throughout 1989, the USEPA Technical Assistance Team (TAT) sampled residential wells in the Southeast Rockford area and tested for the following abbreviated list of VOCs:

- Trichloroethylene,
- Cis-1,2-Dichloroethylene,
- 1,2-Dichloroethane,
- 1,1,1-Trichloroethane,
- Trans-1,2-Dichloroethylene, and
- 1,1-Dichloroethane.

Additionally, fourteen samples were also analyzed using gas chromatography/mass spectroscopy (GC/MS) for these compounds and 24 additional VOCs. This USEPA/TAT data correlates well with the full volatile scan IDPH data, indicating that the VOC contaminants of concern in the study area consist of chlorinated solvents as discussed in the next subsection.

To date, USEPA has initiated a removal action under which bottled water was offered as a temporary measure to residents whose well water analysis results revealed VOC levels greater than or equal to 25 percent of the RAL. In mid-December 1989, the wells in these residences were equipped with carbon filters as an intermediate solution to the problem. As discussed in Subsection 1.2, a more permanent solution is currently being implemented.

2.4 CONTAMINATION ASSESSMENT

A number of contaminants have been detected in groundwater in the study area during IEPA, IDPH, and USEPA/TAT studies. The IDPH and USEPA/TAT sample analysis data are summarized in Tables 2-1 and 2-2.

In order to illustrate the approximate area affected by the plume of VOC-contaminated groundwater, a plume concentration map for TCE based on existing IDPH and USEPA/TAT data is included as Figure 2-1. Although the VOC plume contains other components in addition to TCE, TCE has been chosen as an indicator parameter to illustrate the general distribution of VOC-contaminated groundwater at the site. Review of USEPA/TAT data indicates that the other VOC contaminants in the study area have the same general distribution as the TCE plume shown in Figure 2-1.

Because IDPH has sampled the Southeast Rockford area extensively since 1984, the IDPH data set was considered along with the USEPA/TAT data set in determining the current concentrations of contaminants across the study area. Movement of contaminant plumes through the subsurface can cause concentrations measured at a single location such as a private well to

Table 2-1
Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	3\80										
Trichlorofluoromethane											
1,1-Dichloroethene	15\80	1	30	7	7	3	3.8%	6	7.5%	3	3.8%
1,1-Dichloroethane	21\80	1	78								
Trans-1,2-Dichloroethene	10\80										
Chloroform	8\80	1	5								
1,2-Dichloroethane	12\80	1	23	5	5	1	1.3%	3	3.8%	1	1.3%
1,1,1-Trichloroethane	40\80	ND	159	200		0	0.0%	3	3.8%		
Carbon Tetrachloride	2\80	2	27	5	5	1	1.3%	1	1.3%	1	1.3%
Bromodichloromethane	1\80	2	2								
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	42\80	ND	58	5	5	9	11.3%	12	15.0%	9	11.3%
Benzene	1\80	7	7	5	5	1	1.3%	1	1.3%	1	1.3%
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene	1\80			700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	3\80	3	65								
Vinyl Chloride				2	2						
Tetrachloroethylene	39\80	ND	7	5**	5	1	1.3%	3	3.8%	1	1.3%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

Table 2-1
Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (Pre-December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	17\187										
Trichlorofluoromethane	2\187	2	19								
1,1-Dichloroethene	109\187	ND	63	7	7	43	23.0%	51	27.3%	43	23.0%
1,1-Dichloroethane	115\187	2	81								
Trans-1,2-Dichloroethene	12\187	1	12								
Chloroform	24\187	1	14								
1,2-Dichloroethane	25\187	ND	16	5	5	13	7.0%	17	9.1%	13	7.0%
1,1,1-Trichloroethane	164\187	1	436	200		28	15.0%	54	28.9%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	165\187	1	122	5	5	109	58.3%	119	63.6%	109	58.3%
Benzene	1\187	7	7	5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane	16\187	2	74								
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100/5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	8\187	7	108								
Vinyl Chloride				2	2						
Tetrachloroethylene	113\187	ND	15	5**	5	9	4.8%	22	11.8%	9	4.8%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

Table 2-1
Summary of Historical Sampling Results

Source: IDPH
Year: 1988

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluromethane											
1,1-Dichloroethene	8\17	ND	4	7	7	0	0.0%	1	5.9%	0	0.0%
1,1-Dichloroethane	8\17	ND	25								
Trans-1,2-Dichloroethene											
Chloroform	9\17	ND	7								
1,2-Dichloroethane	1\17			5	5						
1,1,1-Trichloroethane	13\17	2	140	200		0	0.0%	2	11.8%		
Carbon Tetrachloride	1\17			5	5						
Bromodichloromethane	1\17										
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	12\17	1	140	5	5	8	47.1%	10	58.8%	8	47.1%
Benzene				5	5						
Dibromochloromethane	1\17										
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	11\17	ND	14	5**	5	1	5.9%	6	35.3%	1	5.9%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

Table 2-1
Summary of Historical Sampling Results

Source: IDPH
Year: 1985

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l) Minimum	RANGES (ug/l) Maximum	MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL #	SAMPLES >/= MCL %	SAMPLES >/= 50% MCL #	SAMPLES >/= 50% MCL %	SAMPLES >/= PRS #	SAMPLES >/= PRS %
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluromethane											
1,1-Dichloroethene	42/43	1	154	7	7	35	81.4%	38	88.4%	35	81.4%
1,1-Dichloroethane	39/43	1	64								
Trans-1,2-Dichloroethene	33/43	1	7								
Chloroform											
1,2-Dichloroethane				5	5						
1,1,1-Trichloroethane	43/43	3	153	200		0	0.0%	10	23.3%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	41/43	1	88	5	5	33	76.7%	35	81.4%	33	76.7%
Benzene				5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	26/43	1	8	5**	5	3	7.0%	13	30.2%	3	7.0%

* Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

Table 2-1
Summary of Historical Sampling Results

Source: IDPH
Year: 1984

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	2\49	3	9								
Trichlorofluoromethane											1
1,1-Dichloroethene	46/49	2	236	7	7	39	79.6%	41	83.7%	39	79.6%
1,1-Dichloroethane	45\49	2	83								
Trans-1,2-Dichloroethene	31\49	1	3								
Chloroform	1\49	2	2								
1,2-Dichloroethane				5	5						
1,1,1-Trichloroethane	48\49	2	188	200		0	0.0%	6	12.2%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	45\49	1	45	5	5	34	69.4%	39	79.6%	34	69.4%
Benzene				5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	23\49	1	3	5**	5	0	0.0%	1	2.0%	0	0.0%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

Source: USEPA/TAT
Year: 1989

Table 2-2
SUMMARY OF HISTORICAL SAMPLING RESULTS

GC-MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples >/= MCL		Samples >/= 50% MCL		Samples >/= PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorbromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichlorethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1-Dichloroethylene	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-894								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methylene Chloride	2\2 (b)	15.5-19.5								
1,1,2,2,-Teterachloroethane	1\14	1.9								
Tetrachloroethylene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Toluene			2000**	2000						
1,1,1-Trichloroethane	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
1,1,2 Trichloroethane	3\14	1.1-2.8								
Trichloroethylene	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
Trichlorofluoromethane	1\14	3								
Vinyl Chloride			2	2						
m & p-Xylene (as m-Xylene)				10000						
O-Xylene										

** Safe Drinking Water Act Maximum Contaminant Level (MCL)*
***Proposed MCL (May, 1989)*
****Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)*
a=Results for this chemical for two of the fourteen samples are not legible. These are not included in the tablulation of the following columns.
b=Only two samples were tested for the presence of Methylene Chloride.

Table 2-2

Source: USEPA/TAT

Year: 1989

SOUTHEAST ROCKFORD

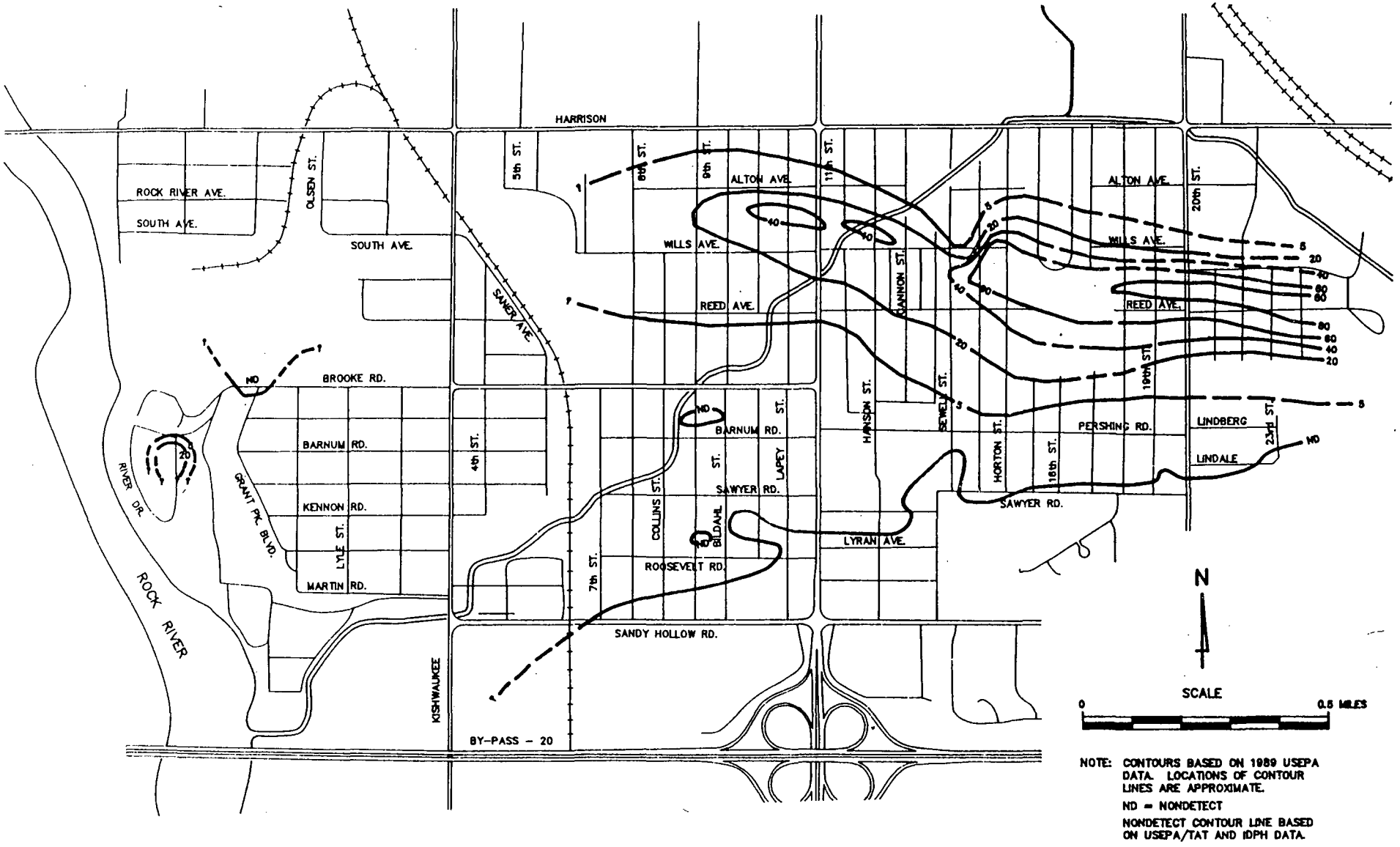
SUMMARY OF HISTORICAL SAMPLING RESULTS

PARAMETER	# DETECTED/ # SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples >/= MCL		Samples >/= 50% MCL		Samples >/= PRS	
					#	%	#	%	#	%
Trichloroethylene	97/113	.45-120	5	5	67	59.3%	76	67.3%	67	59.3%
1,1,1-Trichloroethane	97/113	.60-397	200	200	15	13.3%	35	31.0%	15	13.3%
Cis-1,2-Dichloroethylene	87/113	.58-323	70**	100	12	10.6%	29	25.7%	5	4.4%
Trans-1,2-Dichloroethylene	13/113	.57-2.5	100**	100	0	0.0%	0	0.0%	0	0.0%
1,2-Dichloroethane	37/113	.52-4.0	5	5	0	0.0%	6	5.3%	0	0.0%
1,1-Dichloroethane	85/113	.69-133	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Safe Drinking Water Act Maximum Contaminant Level (MCL)*

***Proposed MCL (May, 1989)*

****Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)*



CDM

environmental engineers, scientists, planners, & management consultants

TCE CONCENTRATION IN PRIVATE WATER WELLS (in ug/l)

FIGURE NO.

2-1

vary with time. To minimize any potential effects related to temporal variations in contaminant concentrations, only data since 1988 was evaluated for this study. The IDPH data covers a greater area and has greater spatial density than the USEPA/TAT data; therefore, the IDPH data was useful in defining the plume. Although the IDPH data was considered in defining the sampling points, variability in the data did not allow strict adherance to the IDPH data points in constructing contaminant concentration maps.

The VOCs that will be analyzed for the Operable Unit include the VOC contaminants of concern listed in Table 2-3. All of the contaminants of concern except vinyl chloride have been detected during previous groundwater studies in the Southeast Rockford study area. Vinyl chloride is a degradation product of several VOCs detected in groundwater samples in Southeast Rockford, and will be analyzed for because of its toxicity at low concentrations.

Metals have been analyzed in only a limited number of samples in the Southeast Rockford Operable Unit study area. Chromium was detected by IEPA in a 1984 investigation of illegal disposal of plating wastes in a well located at 2613 South 11th Street. Detailed information from this investigation is not available. Cadmium and lead were detected at levels in excess of the MCL in groundwater at Barrett's Mobile Home Park (located at Harrison and Marshall) in 1988 during a routine IEPA investigation of community water supply wells. In the same study, arsenic was detected in one well at a concentration of 25% of the MCL for arsenic. Due to the limited extent of the inorganic data in the study area, all of the samples collected during the Operable Unit will be subjected to inorganic analysis for a list of target metals, which includes cadmium, chromium, arsenic and lead.

All groundwater samples for the Operable Unit will be analyzed using analytical methods with detection limits sufficiently low to ensure comparability of analytical results to the current applicable drinking water standards.

The following VOCs and metals have been identified as contaminants of concern based on frequency of detection, percent of samples exceeding MCLs or proposed MCLs, and chemical degradation relationships. The contaminants of concern and historical ranges of detection in the study area are listed in Table 2-3.

TABLE 2-3

CONTAMINANTS OF CONCERN	RANGE (ug/l)
Trichloroethylene (TCE)	ND to 140
1,1,1-Trichloroethane (1,1,1-TCA)	ND to 436
Cis-1,2-Dichloroethylene (cis-1,2-DCE)	ND to 323
1,1-Dichloroethylene (1,1-DCE)	ND to 63.4
Tetrachloroethylene (PCE)	ND to 15.1
1,2-Dichloroethane (1,2-DCA)	ND to 13.6
1,1-Dichloroethane (1,1-DCA)	ND to 320
Trans-1,2-Dichloroethylene (trans-1,2-DCE)	ND to 6.7
Vinyl Chloride	ND
Lead	11 to 31
Cadmium	5 to 14
Chromium	?*
Arsenic	ND to 12

ND = Not detected.

* Chromium was detected in groundwater at 2613 11th Street by IEPA in 1984. Chromium concentrations at this location are not known because sample analyses for this sampling event are not available.

(Note: Total 1,2-DCE was detected at 894 ppb at one residence sampled on 8/9/90 by USEPA/TAT)

3.0 OPERABLE UNIT REMEDIAL INVESTIGATION SCOPE OF WORK

3.1 OBJECTIVES OF THE OPERABLE UNIT REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

The objectives of the Operable Unit RI/FS are to determine which residences outside the Removal Action area are affected or potentially affected by the contaminant plume and to develop, evaluate, and identify the most cost-effective alternative for providing those residents a safe source of drinking water in a timely manner.

3.2 DATA REQUIREMENTS

The following tasks have been identified for accomplishing the Operable Unit RI/FS objective.

- Conducting two site visits to familiarize personnel with existing site conditions and to assist in selection of sampling locations.

- Conducting a well survey to determine which residences within the study area are served by private wells and therefore potentially affected by the groundwater contamination. Sampling locations will be selected based upon this information.

- Collecting groundwater samples from residential, industrial, and municipal supply wells within the study area to address data gaps remaining following previous sampling events by USEPA/TAT and IDPH; and

- Conducting a limited Risk/Endangerment Assessment to evaluate the health risk to affected populations.

3.3 WELL SURVEY

To determine which residences outside the Removal Action area are served by private wells and therefore potentially affected by groundwater contamination, IEPA is conducting an ongoing survey of residents within the study area. Results of the survey have been used to establish sampling locations in the area north of Sawyer Road as discussed below in Subsection 3.4.

Significant data gaps that exist after the IEPA survey will be addressed in the field by a door-to-door survey which will be conducted by IEPA with the assistance of CDM.

3.4 RESIDENTIAL WELL SAMPLING

CDM proposes to collect 144 investigative samples (not including QA/QC samples) from residential wells in the study area to complement the USEPA/TAT and IDPH data and to more accurately define those residences affected by groundwater contamination. The principal objective of the sampling during the Operable Unit is to identify residential wells in the study area that 1) are contaminated at levels between the MCLs and the method detection limits for any contaminant; 2) are not currently served by municipal water; and 3) will not be connected to the municipal water supply by the USEPA Remedial Action. An additional objective of sampling is to maximize data coverage by avoiding resampling of residences that have been previously sampled. Therefore, the proposed sampling locations are concentrated outside of the known plume area (outside the 5 ppb contour for TCE) and in areas that were not sampled during previous studies or where previous sampling indicates variable contaminant concentrations. However, a small amount of resampling of residences previously sampled by IDPH (approximately 7 percent of the investigative samples) is proposed in order to assess plume movement, seasonal effects, and to verify comparability of data from the current study with data from previous studies.

IEPA has conducted a residential well survey to identify residents in the study area that may use private wells to obtain potable water. The survey was conducted by directly sending questionnaires to residents that may be affected by the groundwater contamination. The survey coverage is not complete; final survey results are not yet available for areas south of Sawyer Road, and no response to the survey has been obtained for about 25 percent of the residences in the area covered by the survey. The area south of Sawyer Road and the homes which did not respond to the survey are currently being addressed by IEPA by the ongoing residential well survey. The existing survey data is the most current and applicable data regarding existence of private water supply wells in the area, therefore the survey results were the primary resource used to determine proposed sample locations for the IEPA Operable Unit. The survey results as of April 4, 1990 were used to determine the sample locations.

In areas where the IEPA residential well survey did not provide information on the use of private wells, city of Rockford billing records supplied by Virginia Wood of IEPA were used to determine private well use. Because of known inaccuracies in the billing records, some sample locations in the area south of Sawyer Road were selected in areas where the billing records indicate that there may be no private wells, in order to achieve adequate sample coverage. In those areas, locations of private wells will be identified by the residential well survey currently being conducted by IEPA. Existence of private wells will be confirmed in the field prior to collecting samples.

A third source of information used in selecting sample locations was previous sampling events by IDPH and USEPA/TAT. Residences that have been sampled by USEPA were identified from chain-of-custody records and residences sampled by IDPH were identified from a database listing provided by Clay Simonson of IDPH. Residences that have been sampled since 1988 were avoided in the proposed sample locations. However, in order to assess data comparability and potential plume migration, an overlap of approximately 7 percent was allowed between residences previously sampled by IDPH in 1988 and 1989 and proposed sample locations.

Finally, the area within the plume as defined by the existing data, areas to be served by the USEPA Removal Action, and residences previously sampled by USEPA have been excluded from the proposed sample locations. The area to be addressed by the Removal Action has been determined based on a map provided by Ken Theisen of USEPA.

Using these sources of information, a list of proposed sample locations was developed, which is included as Table 3-1. A map of proposed and existing sample locations is included as Plate A attached to the back cover of this document. Because of the inaccuracies inherent in the database regarding locations of private wells in the study area, these sampling locations should be considered tentative, and may be modified in the field depending on access, the presence of private wells, and other factors. Any remaining data gaps or inaccuracies in the proposed sampling locations will be addressed in the field by a door-to-door survey.

In order to achieve sample coverage in a cost-effective manner within the areas to be sampled, a total of 144 investigative sample locations are proposed, which will define the horizontal extent of groundwater contamination within a lateral resolution of one block or better. Because the depths of the screened intervals for private wells at the proposed sample locations are not known, it is not anticipated that the proposed samples will define vertical extent of groundwater contamination.

In the area west of 8th Street proposed sample locations were selected with a sample density of one sample per block. Because the residential well survey has not yet been completed, some proposed sample locations were chosen at residences where existence of a private well has not yet been confirmed. Consequently, it may be necessary to adjust these sample locations in the field. In this event, the target sample density of one sample per block will be maintained if possible. There is very little existing data in this area, therefore it is felt that a distribution of one sample per block is necessary to define the plume. This distribution also

Table 3-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address	Street	Address	Street	Address
4th	2805	11th	3015	Brooke	106
4th	2820	11th	3119	Brooke	202
4th	2917	11th	3208	Brooke	326
4th	3011	11th	3215	Brooke	411
4th	3045	11th	3301	Brooke	430
5th	2604	11th	3329	Brooke	613
7th	3115	15th	3135	Brooke	823
7th	3221	16th	3102	Brooke	914
7th	3305	16th	3122	Brooke	1101
7th	3337	17th	2602	Brooke	1202
8th	2914	17th	3120	Brooke	1317
8th	3009	17th	3141	Collins	2801
8th	3109	18th	3110	Collins	2825
8th	3138	19th	2622	Collins	3029
8th	3201	20th	2703	Collins	3109
8th	3237	20th	2717	Collins	3126
8th	3301	20th	3109	Collins	3245
8th	3337	Barnum	305	Collins	3310
9th	2624	Barnum	409	Fitch	407
9th	2730	Barnum	505	Fitch	507
9th	2808	Barnum	611	Fitch	601
9th	2842	Barnum	825	Fitch	807
9th	2927	Bildahl	3009	Grant	3045
9th	3102	Bildahl	3017	Grant	3107
9th	3210	Bildahl	3038	Hamilton	1735
9th	3245	Bildahl	3122	Harrison	733
10th	2627	Bildahl	3141	Harrison	1001
10th	3110	Bildahl	3206	Harrison	1713
11th	2613	Bildahl	3302	Harrison	1817
11th	2955	Bildahl	3338	Harrison	2315

Table 3-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address	Street	Address
Johnson	1737	Ranger	801
Kennon	315	River Blvd.	3007
Kennon	415	River Blvd.	3117
Kennon	517	River Blvd.	3125
Kennon	621	Rock Riv. Ave	508
Kishwaukee	3037	Roosevelt	843
Kishwaukee	3112	Sandy Hollow	728
Kishwaukee	3302	Sandy Hollow	826
Kishwaukee	3336	Sandy Hollow	1202
Lapey	3013	Sandy Hollow	1306
Lapey	3038	Sandy Hollow	1820
Lapey	3137	Saner	2905
Lapey	3213	Saner	3011
Lapey	3230	Saner	3110
Lapey	3325	Sawyer	319
Lindale	2406	Sawyer	407
Lindale	2620	Sawyer	525
Lindberg	2412	Sawyer	615
Lindberg	2619	Sewell	2622
Lyran	1616	Sewell	2646
Lyran	1701	Sewell	3137
Marshall	3125	South	527
Marshall	3137	South	619
Martin	430	Taft	801
Martin	508		
Martin	618		
Mattis	827		
Olsen	2812		
Pershing	1637		
Pershing	1726		

assumes that if water mains are installed in this area as part of the Operable Unit they will extend the entire length of the block because it will not be possible to determine any mid-block cutoffs with one sampling point per block.

In the area east of 8th Street, proposed sample locations were chosen by CDM in conjunction with IEPA and USEPA. For the purposes of this investigation, it has been assumed that existing USEPA/TAT and IDPH data adequately define the plume of VOC-contaminated groundwater at TCE concentrations greater than or equal to the MCL (5 ppb). All proposed sample locations have therefore been selected outside the 5 ppb TCE contour (Figure 2-1). The TCE plume was chosen to represent the extent of groundwater contamination by VOCs because the area represented by the plume of groundwater contaminated at levels exceeding the MCL for TCE encompasses all areas exceeding the MCL for the other VOCs detected at the site.

In those areas outside of the plume east of 8th Street, sample locations were selected based on existence of data gaps, presence of private wells, and previous sampling episodes. Within the constraints of these parameters, a sampling density of 1 to 2 samples per block was established as a goal, with the greater sample density concentrated near the margins of the plume. In this area it may be possible to have better lateral definition of the affected blocks by using a combination of existing and new data. This will be dependent on the degree of data comparability between the sampling events.

Figure 2-1 shows the approximate contour line for homes with TCE values below detection limits based on existing IDPH and USEPA/TAT data. This line should be considered approximate because the data collection dates extend over two years (1988 and 1989) and the detection limits and analytical methods used have not been defined. The area east of 11th Street has been more extensively sampled than that area between 8th and 11th Streets. Therefore, a distribution of approximately one residence per

block east of 11th Street and a distribution of two residences per block between 11th and 8th Streets were chosen based on the distribution of existing data. Sample locations have been selected both inside and outside the non-detect contour line. The sampling in areas outside the non-detect contour line is warranted in order to assess the extent of the metals contamination and to assess the cumulative health risks associated with the target volatile compounds (including TCE) that may be present at levels below the detection limits of the existing data.

3.5 INDUSTRIAL WELL SAMPLING

A review of aerial photographs indicates that there are approximately 26 sizeable industrial operations in the study area. Based on results of the response to the IEPA well survey, CDM will determine whether any of these industries are using groundwater as a potable water source. Only those industries using private wells for potable water will be sampled. It is anticipated that groundwater samples will be collected from a maximum of 10 industrial locations. Selection of industries to be sampled will be based on location with respect to the contaminant plume and accessibility of sampling, in addition to the requirement that the groundwater is used for potable water.

3.6 MUNICIPAL SUPPLY WELL SAMPLING

In addition to sampling residential and industrial wells, a sample from Municipal Supply Well 35, located at 2944 Bildahl, will be collected. This sampling will be conducted to provide information for subsequent FS tasks.

3.7 STORAGE AND DISPOSAL OF INVESTIGATION-GENERATED WASTES

Because sampling activities will be limited to the sampling of residential and drinking water wells, no liquid or solid hazardous wastes are expected to be generated.

3.8 DATA VALIDATION, ASSESSMENT, AND COMPILATION

Initial Contract Compliance Screening Level data validation will be conducted by the USEPA Contract Laboratory Program (CLP) to determine whether the data meets contract requirements as specified by the IFBs/SOWs for organic and inorganic analysis. The CDM data validation team will validate data received from the CLP to determine whether the data meets the requirements of the quality assurance project plan (QAPP). All data validation activities will be conducted in accordance with current USEPA guidance (i.e., USEPA's Laboratory Data Validation Functional Guidelines). Factors to be considered in data validation include sample holding times, instrument tuning and performance, instrument calibration, blanks, surrogate recoveries, matrix spike/matrix spike duplicate analysis, and other quality control parameters. The specifications provided in the guidelines and acceptance criteria given by the USEPA Central Regional Laboratory Quality Assurance Section will be followed when conducting data validation.

Data assessment will be conducted upon completion of data validation activities. The assessment will be based on new data and existing data determined to be consistent with the goals of the investigation. The data will be assessed based on usability for project objectives and will be summarized in a logical, usable format for data manipulation.

3.9 RISK ASSESSMENT

The Risk Assessment will be conducted to establish a baseline Public Health Assessment for the study area. The assessment will be limited in scope and will be developed in accordance with USEPA guidance documents, Risk Assessment Guidance for Superfund and the Human Health Evaluation Manual, and referenced documents therein. The manual guidelines will be modified as necessary to better suit IEPA's needs. Because this is an Operable Unit investigation with the sole objective of protecting human health with

respect to the study area drinking water, a full risk assessment as defined by CERCLA will not be necessary. The risk assessment to be performed during the phased RI/FS will address human health as well as environmental concerns. The results of the Operable Unit Risk Assessment will be included as a section in the RI Technical Memorandum.

The baseline evaluation will commence with input from the site investigation phases regarding chemicals, receptors, migration and exposure routes, and other site-specific factors. A limited list of indicator chemicals will be selected and their exposure concentrations to humans will be assessed. The assessment will include an estimation of human intake of the chemicals and characterization of human health risks for potential carcinogens and noncarcinogens. The evaluation for the Operable Unit will consist of the following tasks:

- Obtaining receptor, chemical, and migration and exposure data collected during the RI;
- Calculating indicator compounds and comparing to ARARs;
- Documenting the analysis and submitting draft report of the findings to IEPA for review; and
- Incorporating the final Risk Assessment as a section of the Technical Memorandum.

3.10 DRAFT AND FINAL REMEDIAL INVESTIGATION TECHNICAL MEMORANDUM

Following receipt of all analytical data, CDM will prepare a draft RI Technical Memorandum. The Technical Memorandum will summarize all site investigations and will be organized and presented in a manner showing the relationship between site investigations for each matrix. The Technical Memorandum will also be structured so that sample collection details and

respective analytical or measurement data can be easily cross-referenced. The general format the Technical Memorandum will follow is presented in Table 3-2. Subsections of the format that do not apply as a result of the Operable Unit will be so stated in the report and will not be addressed further.

As part of the Operable Unit study, CDM will develop a computerized geographic database system, which will be used to manipulate and display site data. This geographic database system is a Computer Aided Design (CAD-based) tool which will assist in efficient management of the new data which will be collected during the study, in addition to the large amount of existing data. Using CDM's proprietary Infraworks software, a detailed site map will be developed based on plat maps provided by the City of Rockford, which will act as a base map for display of sample locations, contaminant concentrations, historic data, and other relevant data. The database will be used to graphically display the findings of the Operable Unit study for the Technical Memorandum, and will also be used as a basis for the Feasibility Study.

The Technical Memorandum will also include the results of the Risk Assessment. The Risk Assessment will evaluate the no-action or other appropriate alternatives based on the actual or potential threat to public health. Actual or potential risks will be quantified whenever possible.

The draft Technical Memorandum will be submitted to IEPA and USEPA for review. Following transmittal of substantive comments compiled by the IEPA Project Manager, CDM will revise the report and submit a final report for approval. Upon approval, final copies of the Technical Memorandum will be printed and submitted to IEPA and USEPA for distribution to all involved parties. A total of 25 copies of the report will be prepared.

3.11 COMMUNITY RELATIONS

The community relations task is designed to assist IEPA in the planning and implementation of a site-specific community relations program for the Southeast Rockford study area.

TABLE 3-2
REMEDIAL INVESTIGATION
TECHNICAL MEMORANDUM FORMAT

1.0 INTRODUCTION

- 1.1 Purpose of Report
- 1.2 Report Organization

2.0 STUDY AREA INVESTIGATION

- 2.1 Includes description of field activities associated with site characterization. These may include physical and chemical monitoring of some, but not necessarily all, of the following:
  - 2.1.1 Geological Investigations
  - 2.1.2 Groundwater Investigations
  - 2.1.3 Human Population Surveys
  - 2.1.4 Ecological Investigations

3.0 NATURE AND EXTENT OF CONTAMINATION

- 3.1 Presents the results of site characterization of groundwater contamination

4.0 BASELINE ENDANGERMENT ASSESSMENT

- 4.1 Public Health Evaluation
  - 4.1.1 Exposure Assessment
  - 4.1.2 Toxicity Assessment
  - 4.1.3 Risk Characterization
- 4.2 Environmental Assessment

5.0 SUMMARY AND CONCLUSIONS

APPENDICES

A. Analytical Data and QA/QC Evaluation Results
B. Risk Assessment Methods

Community relations support provided by CDM for the project may include the following subtasks at the request of IEPA:

- Preparation of documentation, such as diagrams, plans, charts, etc.;
- Assistance in preparation of responsiveness summaries;
- Attendance and participation in public meetings;
- Preparation of meeting summaries and mailing lists; and
- Other assistance as requested by IEPA.

3.12 CDM QUALITY ASSURANCE/QUALITY CONTROL MANAGEMENT

The Site Manager (SM) is responsible for overseeing overall RI activities and ensuring quality of work. The SM will review daily work assignments of project team members and will interject technical and managerial guidance as needed to increase the quality and minimize cost of work products. The SM is also responsible for ensuring that the specific requirements of the QAPP are satisfied during RI activities.

The SM will also coordinate with CDM's Quality Assurance Manager (QAM) to ensure that major deliverables and summary documents are reviewed by a team of QA reviewers for technical and management accuracy and completeness before submittal to USEPA.

3.13 PROJECT MANAGEMENT

Project management activities will play a key role in successful completion of the Operable Unit in the Southeast Rockford study area. Responsibilities of the CDM Project Manager throughout the Operable Unit will include the following:

- Coordination with IEPA and USEPA to plan scoping and scheduling for the Operable Unit;
- Assurance of timely completion of all scheduled activities;
- Updating IEPA and USEPA on all project schedules;
- Attendance at project review meetings and other meetings necessary to ensure normal progress of work;
- Monitoring of any contractors/subcontractors;
- Preparation of monthly progress reports of technical, schedule, and cost status; and
- Evaluation of documentation and graphics for compliance with IEPA and USEPA standards.

The CDM Project Manager will prepare monthly project reports for submission to the IEPA site manager. These reports will discuss the technical progress of the project and the following items:

- Identification of site and activity being discussed;
- Status of work at the study area;
- Percentage of completion and schedule status;
- Difficulties encountered during the reporting period;
- Actions being taken to rectify problems;
- Activities planned for the following month;

- Changes in personnel; and

- Project cost status.

The monthly progress reports will list target and actual completion dates for each task activity, including project completion, and will explain any deviations that had occurred or are anticipated.

3.14 TECHNICAL AND FINANCIAL MANAGEMENT

The success of the Operable Unit RI/FS depends on sound project management. Both cost control and cost mitigation will be aspects of the project management function. Project management will focus on the following procedures to successfully complete the project:

- Selecting, coordinating, and scheduling staff for task assignments;

- Controlling budgets and schedules;

- Establishing and maintaining project record keeping systems;

- Producing and submitting required reports, including monthly financial and technical status reports and quarterly award fee performance event reports; and

- Performing and coordinating quality control of all technical work.

Meetings will be held periodically with both USEPA and IEPA to discuss project status and address problem areas. Meetings will also be held between designated members of the team and experts in a particular discipline (e.g., hydrogeology, analytical services, quality assurance, etc.).

3.15 SUBCONTRACTOR PROCUREMENT

CDM will subcontract Tiller Consulting Group, Inc., of St. Louis, Missouri to conduct the Risk/Endangerment Assessment Task. No other subcontractors will be required during the Operable Unit. Because subcontracting tasks are estimated to be less than $10,000, federal procurement procedures will not be required.

4.0 FEASIBILITY STUDY

4.1 GENERAL

The results of the Feasibility Study (FS) and subsequent Record of Decision will be used to support an Operable Unit for the Southeast Rockford study area. An Operable Unit is a discrete action that consists of an incremental step (or steps) toward a final remedy. Operable units may address geographic portions of a site, specific site problems, or other subcomponents of a total site contamination problem. For the Southeast Rockford project, the operable unit is intended to address the specific problem of the affected residents' contaminated water supply.

As such, the FS will be a focused effort to analyze a limited number of applicable alternatives, with the sole intent of establishing an alternative water supply. A comprehensive RI/FS for the study area is being conducted as a separate investigation.

4.2 DATA COLLECTION

Relevant available data and reports will be collected and reviewed in order to develop an understanding of the physical setting and contamination problem in the study area and to provide a basis for developing and evaluating alternative water supplies. Any data gaps and inconsistencies will be identified and reported to IEPA. Major categories of information required to conduct the FS include the following:

- Determination of the number, location, and potable water requirements of residences with private wells that a) have access to an existing municipal water main or b) do not have access to an existing water main;

- General well information for all City of Rockford municipal wells including pumping rates, capacity, construction details, usage, maintenance and rehabilitation records, and water quality;

- Rockford water distribution system characteristics, including water main characteristics (e.g., diameters and materials), construction records, water pressures, water quality (hardness, etc.), layouts, and existing treatment facilities.

- Available information regarding hydrogeologic characteristics including aquifer dimensions and yield, hydraulic parameters and boundaries, direction of groundwater flow, potentiometric surface, and aquifer water quality.

After the relevant data have been collected, reviewed, and evaluated, information and conclusions will be summarized and tabulated for ease of reference and inclusion into the final Operable Unit FS report.

During this task, the following agencies will be contacted to obtain information:

- USEPA Region V;

- IEPA;

- Managers of the Rockford and other nearby community water departments;

- ISWS;

- IDPH; and

- ISGS.

4.3 ALTERNATIVES DEVELOPMENT

A limited number of alternatives for providing safe drinking water for affected residents will be developed based on results of the data collection task.

The following approach, in accordance with USEPA guidance documents, will be used in development of the alternatives.

Establishment of Operable Unit Response Objectives

Study-area specific objectives for the Operable Unit will be based on public health and environmental concerns and information gathered during data collection, and will be in accordance with the National Oil and Hazardous Substances Contingency Plan (NCP), USEPA interim guidance, and the requirements of any other applicable federal, state, or local statutes. Response objectives will be developed in close consultation with IEPA with oversight by USEPA.

Identification of Operable Unit Technologies

A limited number of appropriate technologies meeting the response objectives will be identified. Technologies that may prove extremely difficult to implement, not achieve the objective in a reasonable time, or rely on unproven technology will not be considered.

Identification of Alternatives

Alternatives will be identified and developed in close consultation with IEPA and the City of Rockford. The alternatives will incorporate the technologies, response objectives, and other appropriate considerations into a comprehensive, site-specific approach. Alternatives that feature the provision of a safe water supply will be emphasized.

Preliminary alternatives currently planned to be evaluated include the following:

- o No action;
- o Extending water mains and connecting affected residences to the City of Rockford water distribution system;
- o Constructing new residential water wells to withdraw groundwater from an uncontaminated water-bearing zone;
- o Treating contaminated groundwater at existing municipal supply wells; and
- o Installing point of use water treatment devices to reduce contaminant concentrations in existing groundwater.

This listing of preliminary alternatives has been developed with the assumption that an overall remedial action for the Southeast Rockford groundwater contamination condition at the Southeast Rockford study area will be further studied, analyzed, and implemented following the comprehensive RI/FS for the site, which is currently being conducted by IEPA through a separate contract with CDM.

The NCP requires that the no-action alternative be examined in detail to provide a baseline by which other alternatives can be evaluated. As a group, the preliminary alternatives feature relatively short implementation times, the ability to protect human health (by virtue of their ability to provide affected residences with potable water), and are all based on proven technologies. Additionally, the ability of the alternatives to meet the Operable Unit response objectives is somewhat independent of the amount of contamination present in existing residential well water. Because of these characteristics, and the amount of data currently available

concerning the target contaminants, the FS will not include a preliminary screening step normally conducted as part of larger, more complex studies and will proceed with detailed analysis of the preliminary alternatives, augmented by other alternatives if deemed necessary by IEPA.

As each alternative is analyzed, the following nine factors will be used as criteria for evaluation and comparison in subsequent tasks of the FS:

- Protection of human health and the environment,
- Short-term effectiveness,
- Long-term effectiveness,
- Reduction of toxicity, mobility, and volume of contaminants,
- Implementability,
- Cost,
- Compliance with ARARs,
- State acceptance, and
- Community acceptance.

At the conclusion of this task, a brief alternatives array will be compiled, that will consist of preliminary technical descriptions and specific implementation considerations of each alternative. The alternatives array will be submitted to IEPA for review prior to conducting the detailed analysis of alternatives.

4.4 DETAILED ANALYSIS OF ALTERNATIVES

The alternatives generated from the alternatives development task will then undergo detailed analysis according to the provisions of Section 121 of the Superfund Amendments and Reauthorization Act (SARA). This analysis will consist of four major elements: preparing a technical description, conducting an environmental assessment, evaluating institutional issues associated with implementation of the alternative, and comparing costs of the alternatives. Specific activities of the alternatives analysis are discussed as follows.

Technical Description

The technical description of each alternative will include the following:

- Descriptions of appropriate treatment technologies (if applicable);
- Discussions of special engineering considerations required to implement the alternative (e.g., any additional studies, changes in current water supply system operations, or construction required before proceeding with final design);
- Identification of operation, maintenance, and monitoring requirements of the completed remedy;
- Identification of safety requirements for remedial implementation, including both on-site and off-site health and safety considerations; and
- An analysis of phasing the alternatives into operation either individually or in groups to produce significant environmental improvement or cost savings.

Environmental Assessment

An environmental assessment will be conducted that will evaluate each alternative's environmental effects, physical and legal constraints, and compliance with local, state, and federal regulatory requirements.

Where adverse environmental effects are identified, mitigation measures, if any, will be identified.

Each alternative will be assessed for its ability to protect or mitigate damage to public health based on the results of the Risk/Endangerment Assessment.

Cost Analysis

The present worth cost (using a 30-year life with a discount rate of 10 percent before taxes and after inflation [USEPA, 1985]) of implementing each alternative will be calculated. The present worth analysis will include capital costs and operation and maintenance costs associated with each alternative.

4.5 LABORATORY AND BENCH SCALE STUDIES

For any remedial alternative in which a laboratory or bench scale treatability study is deemed appropriate, CDM will submit a separate work plan to IEPA for approval. Only after approval and authorization from IEPA will laboratory studies be conducted. The costs of laboratory studies are not included in this work plan.

4.6 EVALUATION AND COMPARISON OF ALTERNATIVES AND RECOMMENDATION OF ALTERNATIVE

This task will consist of a comparative evaluation of the alternatives according to the nine criteria presented in Subsection 4.3.

Following the comparative evaluation of the alternatives, the one alternative that best satisfies the objectives of operable unit response in a cost effective manner will be identified and recommended.

4.7 FEASIBILITY STUDY DRAFT AND FINAL REPORT

A draft FS report will be prepared for submittal to IEPA and USEPA and will include the findings of the FS tasks. The draft report will summarize data developed during the remedial alternatives assessment process. The project team will recommend an alternative or combination of alternatives for implementation to fulfill the operable unit response objectives. The recommended alternative shall be selected from among those alternatives that meet the following requirements:

- The alternative shall be protective of human health and the environment; implementation of the alternative will meet or exceed ARARs or health-based levels established through a risk assessment when ARARs do not exist or when they are waived.

- Unless the requirements are waived by IEPA, the alternative shall attain federal and state public health and environmental ARARs that have been identified for the specific site.

- The alternative shall be cost-effective, accomplishing a level of protection that cannot be achieved by less costly methods.

An alternative may be selected that does not meet federal and state public health or environmental ARARs under the following circumstances.

- The alternative is an interim remedy and will become part of a more comprehensive final remedy that will meet applicable or relevant and appropriate Federal and State requirements. (The Southeast Rockford Operable Unit response falls into this category.)

- Compliance with the requirement will result in greater risk to human health and the environment than alternative options.

- Compliance with the requirements is technically impracticable.

- The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method or approach.

- The state has not consistently applied or demonstrated the intention to consistently apply the requirement for other remedial actions in the state.

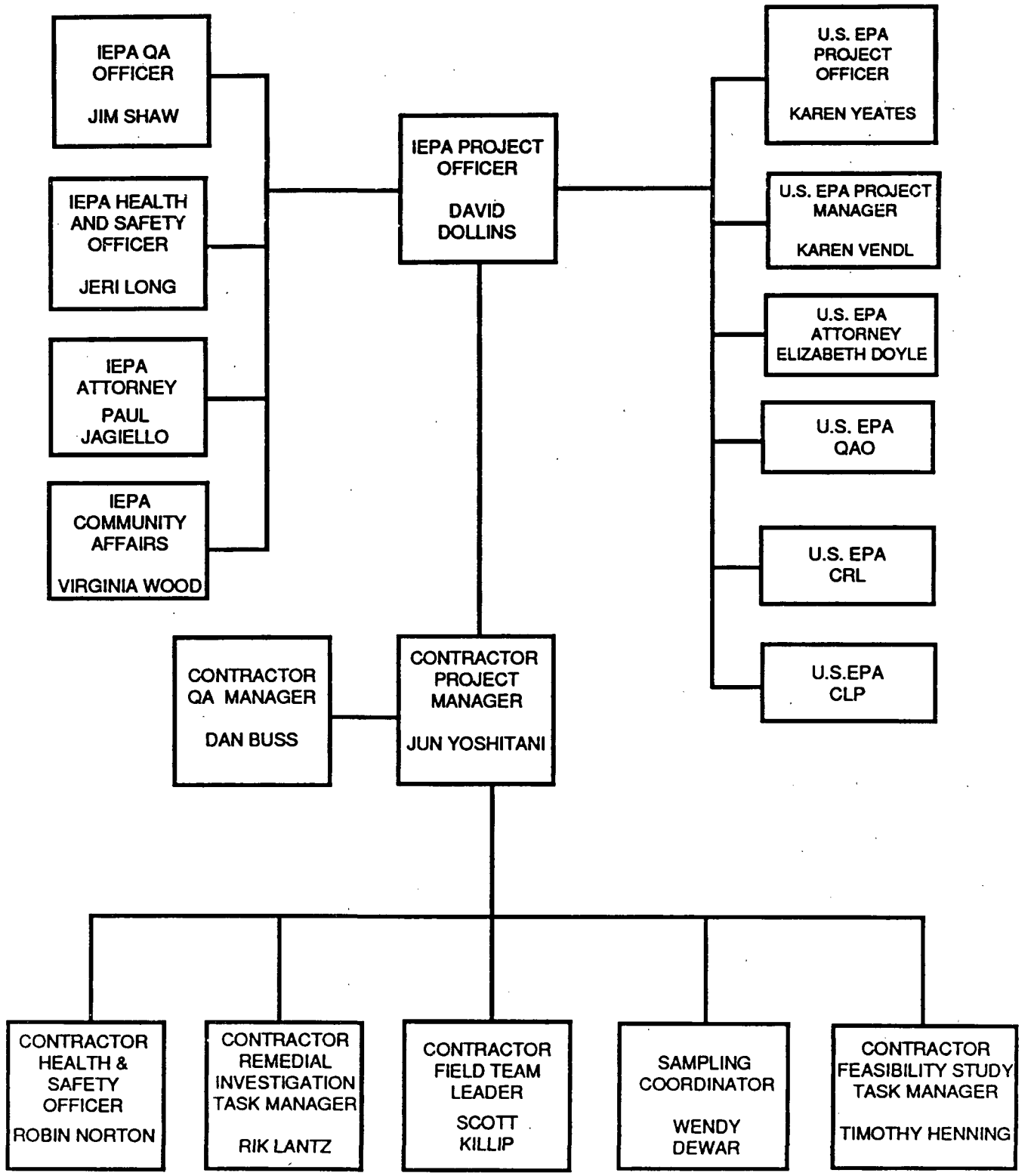
- The alternative will not provide a balance between the need for protection of human health and the environment at the site and the availability of fund monies to respond to other sites that may present a threat to human health and the environment.

A total of 20 copies of the draft FS report will be submitted to IEPA and five copies will be submitted to USEPA. CDM will revise the draft FS to consider and incorporate IEPA's and USEPA's comments as warranted. The draft FS for Public Comment will be adequate to support USEPA's needs throughout the public comment period during IEPA's development of the ROD.

5.0 PROJECT STAFFING

CDM has carefully selected the members of the project team to best match the skills of individuals to specific needs of the Southeast Rockford project. Personnel who have been assigned to the project, and their respective areas of responsibility, are shown in the organization chart in Figure 5-1. Community relations activities will be conducted by IEPA personnel.

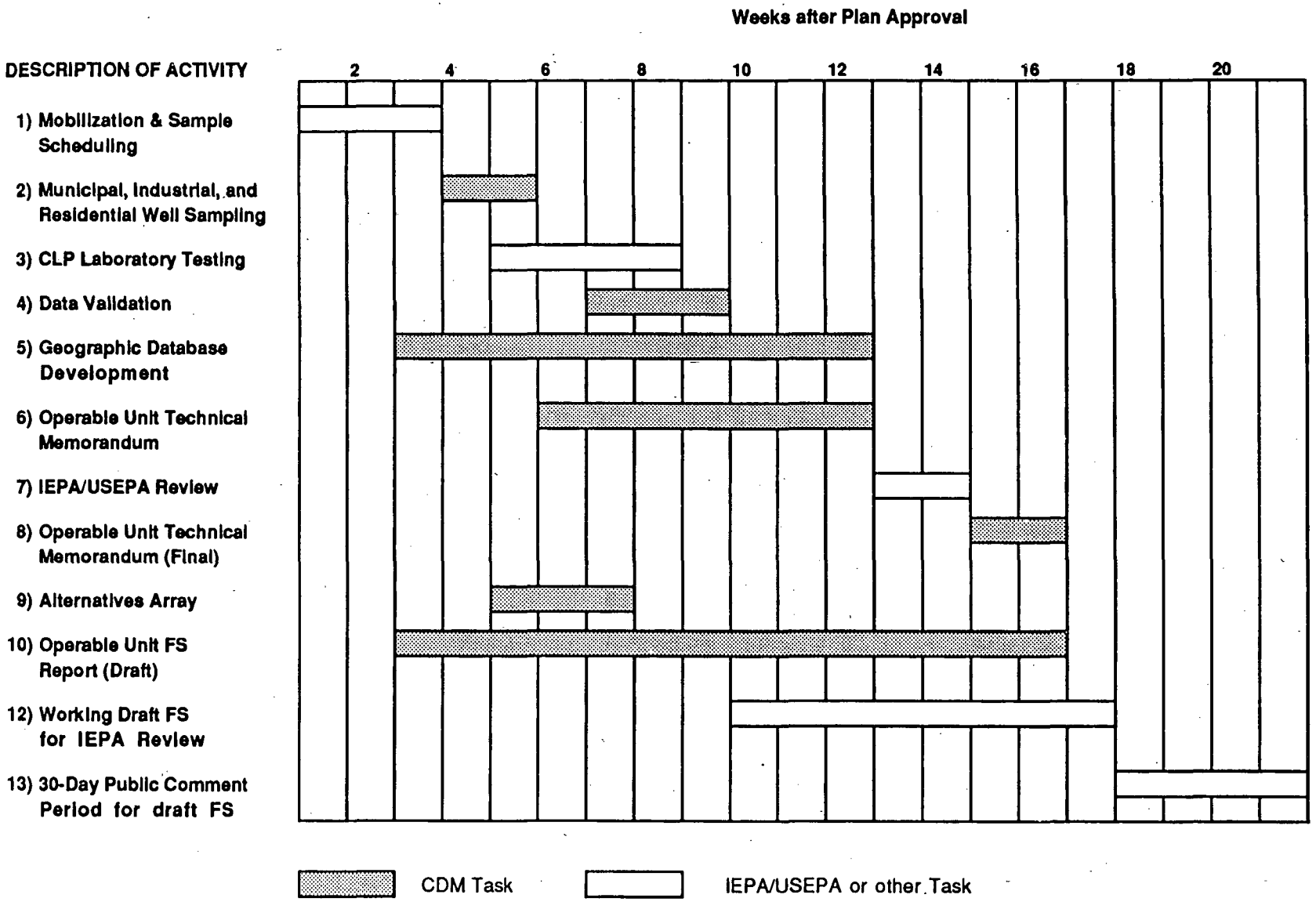
FIGURE 5-1
SOUTHEAST ROCKFORD OPERABLE UNIT
ORGANIZATION CHART



6.0 PROJECT SCHEDULE

The schedule for conducting the Southeast Rockford Operable Unit activities is shown in Figure 6-1. The schedule illustrates the chronological coordination of tasks and is designed to ensure that project milestones specified in the revised statement of work are achieved.

FIGURE 6-1
SCHEDULE OF OPERABLE UNIT ACTIVITIES



HEALTH and SAFETY PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION
OPERABLE UNIT HEALTH AND SAFETY PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
REMEDIAL PROJECT MANAGEMENT SECTION
FEDERAL SITE MANAGEMENT UNIT
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

MAY 16, 1990

PROJECT NO: 1681-3-CG-GEAD

16814/02.2

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION
OPERABLE UNIT HEALTH AND SAFETY PLAN

Prepared by: _____ Date: 6/4/90
Jun Yoshitani, P.E.
Project Manager

Reviewed by: _____ Date: 6/4/90
Robin Norton
Mid-West Area Health and
Safety Coordinator

Approved by: _____ Date: _____
Don Muldoon
Regional Health and
Safety Coordinator

Approved by: _____ Date: _____
Jeri Long
Illinois EPA

16814/02.3

TABLE OF CONTENTS

1.0 INTRODUCTION

PROJECT NAME: SOUTHEAST ROCKFORD-GROUNDWATER CONTAMINATION

STUDY AREA DESCRIPTION:

The Southeast Rockford study area consists primarily of residential neighborhoods located along the southern boundary of the Rockford city limits in Winnebago County. The S.E. Rockford study area boundaries are considered to be Harrison Avenue to the north; the north-south center line of Section 6 to the east; Sandy Hollow to the south and the Rock River to the west. This contaminated area measures approximately two to three square miles. These boundaries were determined by the location of the private and municipal drinking water wells sampled by government agencies and their contractors during the past several years. The study area is shown in Figure 1-1.

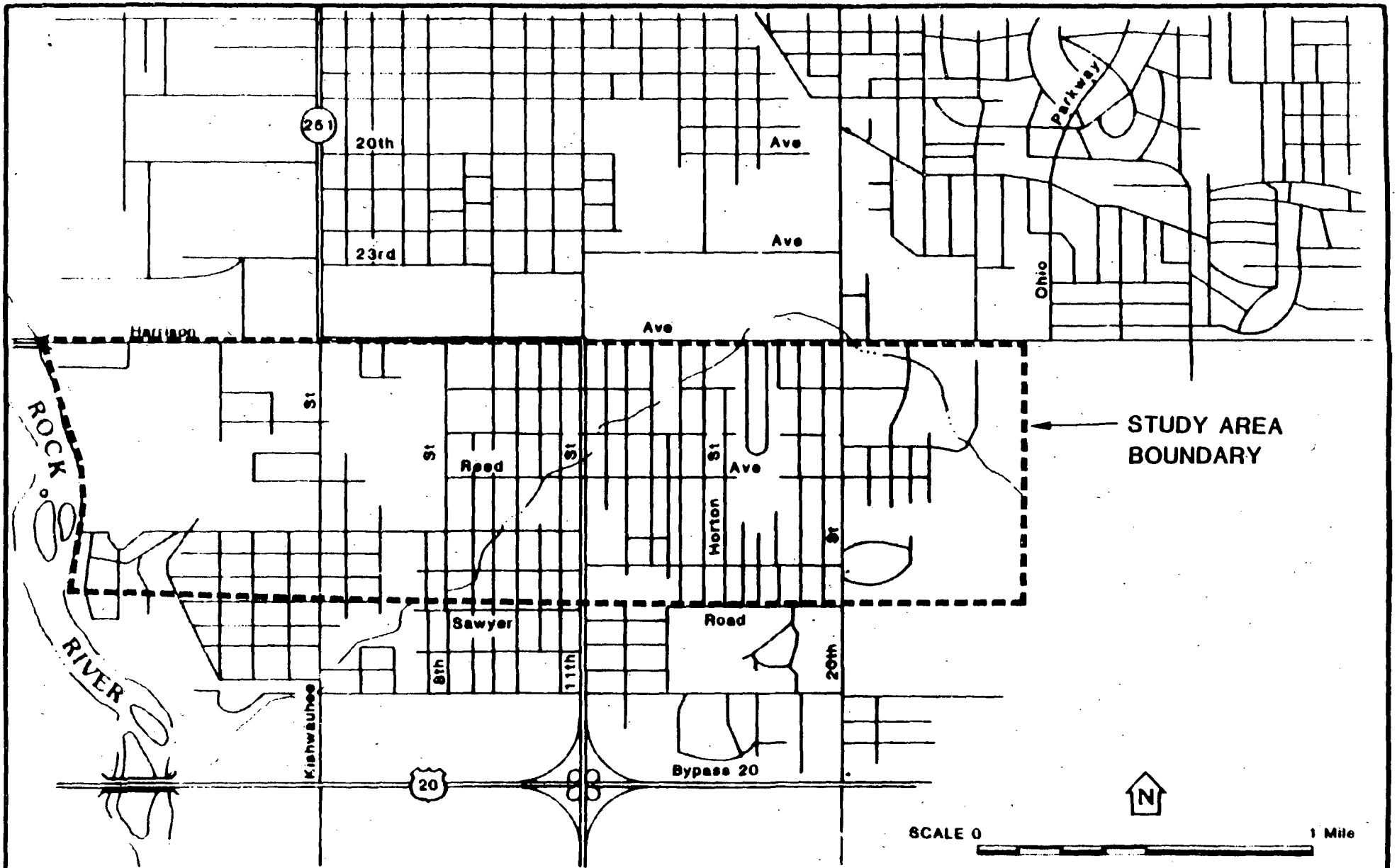
STUDY AREA OPERATIONS:

Conduct residential, municipal supply, and industrial well sampling in order to determine the need for an alternate water supply in areas affected by the contaminant plume.

HISTORICAL SAMPLE RESULTS:

GROUNDWATER:

	CONTAMINANT	RANGE (ppb)
1.	Trichloroethylene (TCE)	ND-140
2.	1,1,1-Trichloroethane (1,1,1-TCA)	ND-436
3.	Cis-1,2-Dichloroethylene (cis-1,2-DCE)	ND-323
4.	1,1-Dichloroethylene (1,1-DCE)	ND-63.4
5.	Tetrachloroethylene (PCE)	ND-15.1



CDM

environmental engineers, scientists, planners, & management consultants

SOUTHEAST ROCKFORD STUDY AREA

FIGURE NO.
1-1

528186

6.	1,2-Dichloroethane (1,2-DCA)	ND-13.6
7.	1,1-Dichloroethane (1,1-DCA)	ND-117
8.	Trans-1,2-Dichloroethylene (trans-1,2-DCE)	ND-6.7
9.	Vinyl Chloride	ND
10.	Lead	11-31
11.	Cadmium	5-14
12.	Chromium	?*
13.	Arsenic	ND-10.5

ND = Not detected.

* = Chromium was detected in groundwater at 2613 11th Street by IEPA in 1984. Chromium concentrations at this location are not known because sample analysis for this sampling event are not available.

STUDY AREA HISTORY:

Groundwater contamination by volatile organic compounds (VOCs) was initially discovered by the City of Rockford in 1981. Four municipal wells in Southeast Rockford were taken out of service in December 1981 as a result of the contamination. In 1982, the City discovered that additional wells were contaminated and closed down more city wells.

Contamination of Municipal Well 35, located near the Ken Rock Playground, was discovered during a routine monitoring of the well in 1984. At that time, the well was tested for 33 priority pollutants, and several VOCs were detected. Because contaminants were present at levels above the MCL, the well was taken out of service in 1985. Subsequent analyses of the treated water in 1989 indicated that none of the original contaminants were present above the level of detection, however, the analysis did show the presence of several trihalomethanes at low levels. These compounds are typically a result of water treatment and are not attributable to the ground water contamination problem in the area. Trihalomethanes are regulated under the Safe Drinking Water Act, however, in this case they do not warrant concern

since they are presect at levels significantly lower than the Maximum Contaminant Level (MCL).

The Illinois EPA discovered VOCs in Southeast Rockford's water in 1984, as a result of a report that plating wastes were being disposed of illegally in a well located at 2613 South 11th Street. In October 1984 the Illinois Department of Public Health (IDPH) initiated an investigation that involved sampling 49 wells in the vicinity. While the investigation did not find significant levels of contaminants common to plating wastes, it did report high levels of chlorinated solvents. These same contaminants were detected in the City of Rockford's municipal well. Further investigation by the IDPH indicated extensive contamination in the area. By 1986, the IDPH was able to define the contaminated area as approximately 1.2 square miles in southeast Rockford, which constitutes the current study area boundaries. The IDPH conducted four separate sampling investigations involving residential wells in the Southeast Rockford area: 49 samples in 1984, 45 samples in 1985, 17 in 1988 and 267 in 1989.

Throughout 1989, the USEPA Technical Assistance Team (TAT) sampled residential wells in the Southeast Rockford area and tested for specific volatile organic compounds (VOCs). All samples were tested for:

Trichloroethylene	1,1,1-Trichloroethane
Cis-1,2-Dichloroethylene	Trans-1,2-Dichloroethylene
1,2-Dichloroethane	1,1-Dichloroethane

Fourteen samples were subjected to analysis using GC/MS which included 24 additional volatile compounds. The EPA data correlate well with the IDPH data, indicating the contaminants of concern to be the group of chlorinated solvents discussed previously.

Since the original investigation, several of the residences with access to the city water main have been connected to the city water supply. The exact number of these connections is not known at this time.

In response to the results of these sampling efforts, USEPA initiated a Removal Action under which bottled water was offered as a temporary measure to those residents whose well test results revealed VOC levels greater than or equal to 50% of the Removal Action Level (RAL). In mid-December of 1989, the wells in these residences were equipped with carbon filters as an intermediate solution to the problem.

The final removal action by USEPA includes providing hookups to city water in areas contaminated by >50% of the Removal Action Level for target compounds. This work is currently in the planning stage. The USEPA expects to begin the construction of water mains and residential hookups in the spring of 1990.

2.0 CHEMICAL HEALTH ANALYSIS

TRICHLOROETHYLENE

PEL-100 ppm
200 ppm Ceiling
TLV-50 ppm
CARCINOGEN

Flashpoint-NONE
Vapor Pressure-58 mm Hg
Ionization Potential-9.47eV

Routes of Exposure	Symptoms of Exposure
Inhalation	Headache, vertigo visual disturbances, tremors,
Ingestion	sleepiness
Contact	Nausea, vomiting, irritation to eyes, dermititis; cardiac arrhythmias, tingling on the skin

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1,1,1-TRICHLOROETHANE

PEL-350 ppm
TLV-350 ppm
IDLH-1000 ppm

Flashpoint-NONE
Vapor Pressure-37 mm Hg
Ionization Potential-9.95eV

Routes of Exposure	Symptoms of Exposure
Inhalation	Headache, lassitude (weariness)
Ingestion	Central Nervous System depressant; Poor
Contact	Equilibrium, irritation to eyes, Dermititis Cardiac arrhythmias

---

CIS OR TRANS 1,2-DICHLOROETHYLENE

PEL-200 ppm
TLV-200 ppm
IDLH-4,000 ppm

Flashpoint-36-39 degrees F
Vapor Pressure-180 to 265 mm Hg
Ionization Potential-9.65eV

Routes of Exposure	Symptoms of Exposure
Inhalation	Irritation to eyes and respiratory system, Central
Ingestion	Nervous System
Contact	depressant

1,1-DICHLOROETHYLENE

PEL-5 ppm
TLV-5 ppm
IDLH-200 mg/Kg

Flashpoint-3 degrees F
Vapor Pressure-600 mm Hg

Routes of Exposure	Symptoms of Exposure
Ingestion Inhalation	Coughing, dizziness, drowsiness and unconsciousness. Excessive exposure may affect the nervous system, liver, and kidneys. Suspected carcinogen.

TETRACHLOROETHYLENE

PEL-100 ppm
200 ppm Ceiling
TLV-50 ppm
CARCINOGEN

Flashpoint-Not Combustible
Vapor Pressure-14 mm Hg
Ionization Potential-9.65eV

Routes of Exposure	Symptoms of Exposure
Inhalation Ingestion Contact	Irritation to eyes, nose, throat Nausea; flushed face, neck; Vertigo, Dizziness, Uncoordination, headache; sleepiness, reddening of skin.

1,2-DICHLOROETHANE

PEL- 50 ppm
100 ppm Ceiling
TLV- 10 ppm
IDLH-1000 ppm

Flashpoint-55.9 degrees F
Vapor Pressure-62 mm Hg
Ionization Potential-9.64eV

Routes of Exposure	Symptoms of Exposure
Inhalation Ingestion Contact	CNS Depressant; nausea, vomiting; skin and eye irritant; headache, dizziness, unconsciousness. Long-term exposures can lead to liver and kidney damage. Suspected carcinogen.

1,1-DICHLOROETHANE

PEL-100 ppm
TLV-200 ppm
IDLH-4,000 ppm

Flashpoint-17 degrees F
Vapor Pressure-182 mm Hg
Ionization Potential-

Routes of Exposure	Symptoms of Exposure
Inhalation Ingestion Contact	Central Nervous System depressant; skin irritation Drowsiness; unconsciousness; liver, kidney damage

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VINYL CHLORIDE

Chloroethylene
PEL-1 ppm
TLV-5 ppm
CARCINOGEN

Flashpoint--108° F
Vapor Pressure-2580 mm Hg
Ionization Potential-9.995eV

Routes of Exposure	Symptoms of Exposure
Inhalation	Weakness, abdominal pain, gastrointestinal bleeding, hematumegaly, pallor or cyanosis of extremities.

LEAD inorganic

PEL-0.05 mg/m^3
TLV-0.15 mg/m^3
CARCINOGEN

Properties vary depending upon specific compound. See also Chemical Infomation Sheet attached.

Routes of Exposure	Symptoms of Exposure
Inhalation Ingestion Contact	Fatigue; insomnia; pallor, eye grounds; anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; hypertention, anemia; tremors, paralysis of wrist.

CADMIUM

PEL-0.2 mg/m^3
0.6 mg/m^3 Ceiling
TLV-0.05 mg/m^3
IDLH-40 mg/m^3
CARCINOGEN

Properties vary depending on specific compound.

Routes of Exposure	Symptoms of Exposure
Inhalation Ingestion	Short-term exposure can cause irritation of the nose and throat; overexposure can cause delayed cough, chest pain, sweating, chills, shortness of breath, weakness and death. Ingestion causes nausea, vomiting, diarrhea and abdominal cramps. Long-term exposure can cause loss of sense of smell, ulceration of the nose, emphysema, kidney damage and mild anemia.

CHROMIUM

Soluble Chromic and Chromous

PEL-0.5 mg/m^3
TLV-0.05 mg/m^3
IDLH-250 mg/m^3

Properties vary depending upon specific compound. See Chemical Information Sheet.

Routes of Exposure	Symptoms of Exposure
Ingestion Contact	Sensitization Dermititis.

ARSENIC

PEL-.01 mg/m^3
TLV-.2 mg/m^3
CARCINOGEN

Properties vary depending on specific compound. See Chemical Information Sheet.

Routes of Exposure	Symptoms of Exposure
Inhalation Absorption Skin/Eye Contact Ingestion	Ulceration of nasal septum, dermititis, gastro-intestinal disturbance, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, carcinogen.

3.0 JOB TASK VERSUS HAZARD ANALYSIS

Residential, Municipal Supply and Industrial Well Sampling	Contact with potentially contaminated groundwater.	o Donn appropriate PPE (See Section 9.0). o Upgrade levels of protection to action levels (See Section 9.0). o Follow decon procedures (See Section 11.0).
	Heat/Cold Stress	o Establish appropriate work schedules to provide sufficient rest periods. o Provide adequate thermal protective clothing for cold weather work and adequate fluids for hot weather work. o See Appendix A for further information.

4.0 STANDARD OPERATING PROCEDURES

4.1 GENERAL WORK RULES

All work performed at the site shall comply with all applicable sections of 29 CFR 1926/1910. The most applicable sections are Subpart C - General Safety and Health Provisions, Subpart D - Occupational Health and Environmental Controls, Subpart F - Fire Protection and Prevention. In addition, all tools used must comply with Subpart I - Tools - Hand and Power. All electrical equipment must comply with Subpart K - Electrical. All excavations must comply with Subpart P - Excavations, Trenching and Shoring.

A Site Health and Safety Coordinator (SHSC) will be assigned by the Project Site Manager, subject to approval by the Regional Health and Safety supervisor. The SHSC has the responsibility to implement the Site Health and Safety Plan (HSP) and the Health and Safety Assurance Manual (HSAM). The SHSC will ensure that all health and safety requirements are rigorously enforced. If the SHSC determines that site conditions have become unsafe, or that HSAM/HSP requirements are not met, the SHSC will suspend site operations until the problem is resolved.

The SHSC will conduct a health and safety briefing at the start of work for all field personnel, including subcontractors, and whenever additional or replacement personnel begin work. The topics covered on this briefing will include:

- review of safety plan;
- emergency procedures;
- location and route to hospital;
- location of emergency equipment and phone numbers;
- general work rules; and
- any non-routine procedures

All personnel authorized to enter the exclusion and contamination reduction zones must be trained in the proper safety procedures, as specified in 29 CFR parts 1926.21 and 1910.120, and will be informed of the possible dangers and hazard present and steps taken to eliminate or mitigate these hazards.

Field work will be conducted only during daylight hours unless adequate night time lighting is provided. The "buddy" system will be observed at all times: a minimum of two people will work together within eye-sight of each other and not more than 100 feet apart. Entry and exit from the exclusion zone and contamination reduction zone will be permitted only through designated access points, except during an emergency or as authorized by the SHSC. Personnel entering the work areas must be wearing the appropriate minimum protective clothing and they must exit these areas at the decontamination station.

Personnel will be encouraged to avoid contamination if at all possible by covering monitoring instruments with plastic bags and by avoiding walking through obviously contaminated areas.

Eating, drinking, smoking, chewing gum or tobacco, or any practice that increases the probability of hand-to-mouth transfer and ingestion of hazardous material is prohibited in the exclusion and contamination reduction zones.

Respiratory protection, if needed, must comply with 29 CFR 1910.134 (b). All workers wearing respirators must be fit tested in the size/model which they will wear on site. Records of this fit test must be kept by a responsible person.

No beards sideburns or mustaches that interfere with respirator mask seals will be allowed. The SHSC will determine if facial hair presents such an interference. Field personnel must ensure adequate mask seals through positive and negative pressure tests each time the respirator is donned.

All field personnel should remain aware of wind direction throughout the day and remain upwind of operations whenever possible. Equipment set up should be directed so that workers may remain upwind of potential sources of exposure. If practical, a wind direction indicator may be erected at the site.

Contact lenses may not be worn at the work site. All field personnel requiring corrective lenses will be provided with prescription glasses and lenses which may be fitted into the respirator masks.

All personnel working at the site must conform to CDM health and safety policy which requires satisfactory completion of health and safety training and enrollment in a medical monitoring program (as per the requirements specified in 40 CRF 265.16 and 29 CFR 1926.20 Subpart C), unless specifically exempted.

Frequent and regular inspections of the work site, materials and equipment used during field investigations will be conducted by either the SHSC and/or subcontractor counterpart for the SHSC. Any equipment or work practices that are judged unsafe, or not in compliance with OSHA or other applicable standards shall be removed, replaced or the work practice corrected. Equipment and machinery shall only be operated by employees qualified by training and/or experience.

Eye wash units must be located within a distance of 100 feet or 10 seconds travel time from the source of any operation which poses a potential for eye injury.

A site evacuation signal must be established prior to the commercement of on-site work. All site workers, including subcontractors, must be notified of this signal and site evacuation procedures.

First aid equipment must be kept on the site in a centrally located area. All on-site workers must be informed of the location of this equipment, which shall include:

- American National Red Cross First Aid Handbook
- Compresses
- Gauze & gauze roller bandage
- Triangular bandages
- Eye dressing packet
- Smelling salts
- Baking soda
- Salt or other emetic
- Portable eyewash unit
- Safety rope & harness
- Oxygen bottles, valves, etc.
- Soap or waterless hand cleaner and towels
- Back brace
- Band aids
- Tape
- Scissors
- Tweezers
- Razors
- Stretcher
- Blankets

5.0 EMPLOYEE EDUCATION AND TRAINING

All IEPA employees and their contractors (including CDM) that are involved in hazardous waste site operations participate in routine health and safety education and training programs. Through training and/or experience, this totals a minimum of 40 hours. For certain job functions this training totals 24 hours. The programs directed by the Office of Chemical Safety (OCS) are designed to provide Agency employees and their contractors with a thorough knowledge of hazardous materials, health and safety hazards potentials, and applicable OSHA and EPA standards. In addition to the Basic training, each employee involved in hazardous waste site operations attends an annual 8 hour Refresher training. The training for Basic level (40 hours) includes the following:

- Basics of Toxicology/Physiology
- Hazardous materials (types/characteristics)
  - Basics of Chemistry
  - Health and Safety Considerations
  - Factors Influencing Chemical Reaction Rates
  - Fire Prevention/Protection
- Selection, Use, and Maintenance of Respiratory Equipment
- Selection, Use, and Maintenance of Personal Protection Equipment
- Atmospheric Testing/Sampling Procedures
- Decontamination Procedures/Personal Hygiene
- Field Exercises in the Use of Level C, B, and A Protection
- Slide Presentations: Confined Space Entry/Excavation and Trenching

- Video Tapes: Emergency Response Guidebook: A Tool for Safety; Fema's Video Tape Broadcasts

In addition to the training conducted within the Agency or contractor organization, employees on a continuous basis attend training courses sponsored by outside groups such as the U.S. EPA.

Daily safety briefings will be conducted before each day's work to discuss such topics as changes to the level of protection, air monitoring requirements, emergency procedures, and any changes in the work plan.

Records of other training courses taken by IEPA employees can be accessed through the OCS/IHU staff or LPC Training Coordinator - Pat McCarthy LPC/Collinsville (618) 346-5120. Records for CDM employees can be obtained through Don Muldoon, Regional Health and Safety Coordinator, Boston, MA (617) 742-5151.

6.0 MEDICAL SURVEILLANCE PROGRAM

All IEPA employees and their contractors that are involved in hazardous waste site operations participate in a medical surveillance program under the direction of a qualified licensed physician. This program includes a baseline, annual, termination physical (when necessary). With the exception of the annual, the physicals consist of the following:

- Comprehensive Health and Exposure History
- Physical Evaluation
- Urinalysis
- Chemistry Screen 20 including total cholesterol and GGTP
- Complete Blood Count (CBC), differential, hematocrit, and hemoglobin
- Chest X-Ray
- Pulmonary Function Testing
- Resting EKG
- Audiometric Screening
- Vision Screening (distant, near, color)
- The annual physical will not contain the Chest X-Ray and Resting EKG. A complete physical will be performed every five years for employees under 40 years of age and every 2 years for employees over 40.

Requirements of medical surveillance programs are subject to change based on a change in contract physician. All IEPA employees involved will be made aware of any and all changes in the program.

Each employee will evaluated to determine if they are physically able to perform their duties while respiratory protective equipment in compliance with 29 CFR 1910.134 and ANSI 288.2-1980.

Additional information on the content of the physicals is available through the OCS/IHU or CDM staff.

Employees may access their medical records through:

IEPA: Dr. Daniel O'Brien
SIU Family Practice
301 North 8th Street
4th Floor
Springfield, Illinois 62701
(217) 782-0215

CDM: Dr. Michael E. Miller
Medical Care Affiliates
One Boylston Plaza
Prudential Center
Boston, Massachusetts 02199
(617) 262-1500

NOTE: For information needed on an emergency basis call the number(s) listed above. For further information contact Dr. O'Brien or Dr. Miller in writing certified return receipt requested.

7.0 KEY PERSONNEL AND ALTERNATES

Field Team Leader:	Scott Killip (CDM) Geologist
Site Health and Safety Officer:	Rik Lantz (CDM) Geologist
Alternates:	Jeri Long or Jeff Niemann (IEPA) Office: (217) 785-0830
Project Managers:	David Dollins (IEPA) Office: (217) 782-6760
	Jun Yoshitani (CDM) Office: (312) 786-1313
Alternate:	Terry Ayers (IEPA) Office: (217) 782-6760

The following individuals located on site will have the authority to change levels of protection and when necessary shutting down the operation:

1. Site Health and Safety Officer: Rik Lantz
2. Field Team Leader: Scott Killip

NOTE: Specific requirements may be revised if during the course of the project new information is received for conditions change which would warrant modification to ensure the safety of workers or the public.

8.0 SAMPLING AND AIR MONITORING PROTOCOL

Residential, municipal supply and industrial well sampling will be performed in order to determine the need for an alternate water supply in areas affected by the contaminant plume.

Groundwater Samples

Residential, Municipal Supply, and Industrial Wells:

1. Purge well.
2. Collect samples in appropriate containers.
3. Seal bottles, follow chain-of-custody.
4. Keep in cooler and transport to laboratory.

Initial air monitoring at this site will be accomplished with the following: OVA-128 or OVA-128GC

- The OVA is calibrated by the factory on an annual basis to 100 ppm and 10,000 ppm Methane.

- Calibration check gas is based on manufacturer's recommendations or through the approval of the OCS/IHU staff.

- Frequency of air monitoring is stated in job task analysis.

- Maintenance, trouble-shooting, turn on procedures, and calibration procedures for specific instrument(s) are included in the Quality Assurance Project Plan.

9.0 PERSONNEL PROTECTION EQUIPMENT

Based on OVA readings in the breathing zone the criteria for levels of protection are as follows:

Before any intrusive work begins, a background reading will be taken. Background reading will be noted. Any readings for determining a level of protection will be above the background reading(s).

FOR SITE CHARACTERIZATION:

- o At Background - Level D
- o > Background to 5 units above background - Level C
- o > 5 units to 500 units above background - Level B
- o > 500 units - shut down re-evaluate

Readings that are used to determine a level of protection should be taken in the worker's breathing zone. The reading should be sustained for fifteen seconds to be considered valid.

These levels were determined based on information known about contaminants on site: concentration, toxicity, chemical properties, maximum use limits of the cartridges to be used, job task or operation, and weather conditions.

DUCT TAPE OUTER GLOVES AND BOOTIES TO CHEMICAL RESISTANT CLOTHING.

LEVEL D: Modified Level D level of protection will be used during residential, municipal supply, and industrial well sampling activities. Workers will utilize the equipment indicated with an asterisk, with a contingency for full Level D or Level C protection.

* 1. Work uniform.

2. Disposable chemical resistant outer gloves - Neoprene - heavy duty.

* 3. Chemical resistant boots with steel toe and reinforced shank Neoprene or PVC.

4. Disposable latex outer booties.

5. Splash goggles - safety glasses - face shield.

6. Hard hat.

* 7. Inner disposable latex, vinyl, or silver shield gloves.

8. Chemical resistant disposable coverall: Saranex.

LEVEL C: Level C protection shall be selected when the types and concentrations of respirable material are known and/or air monitoring of the site and individual work areas has not identified significant levels of airborne chemicals.

1. Full-face air-purifying respirator (MSHA/NIOSH approved) - Type: MSA Cartridge Type: Combination with HEPA filter.

2. Spectacle kits for employees requiring glasses or contacts.

3. Chemical resistant disposable coveralls - Type: Saranex.

4. Gloves - outer chemical resistant - Type: Neoprene.

5. Gloves - inner (disposable 2 pair) - Type: Latex, Vinyl, Silver Shield.

6. Escape mask OPTIONAL.

7. Hard hat.

8. Boot covers - outer (disposable).

9. Boots - inner chemical resistant - Type: Neoprene or PVC.

10. 2-Way radio communication OPTIONAL

LEVEL B

THIS LEVEL OF PROTECTION IS NOT EXPECTED TO BE USED ON SITE.

- To be worn when site conditions pose a severe respiratory hazard.
- To be worn in potential IDLH situations.
- To be worn when site conditions pose a skin hazard but not sufficient enough for Level A protection.
- To be worn when air monitoring indicates conditions warranting an upgrade to Level B. (See action levels.)

1. Self-Contained Breathing Apparatus (SCBA) or Air-line Respirator with Escape Bottle Operated in the Pressure Demand Mode. Type: SCBA-MSA.

2. Spectacle kits for employees requiring glasses or contacts.

3. Chemical resistant - outer Gloves - Type: Neoprene.

4. Disposable inner gloves (minimum 2 pairs) Latex, or Silver Shield.

5. Chemical resistant coveralls - disposable - Type: Saranex.

6. Chemical resistant inner safety boots with steel toe and reinforced shank - Type: Neoprene or PVC.

7. Disposable outer booties - Type: Latex.

8. Face shield (Optional).

9. Hard hat (Task Dependent).

10.0 SITE CONTROL

No site control zones are anticipated as all sampling will be of drinking (residential, municipal supply and industrial) water wells.

11.0 SPECIFIC DECONTAMINATION PROCEDURES

11.1 PERSONNEL DECONTAMINATION

Level D

- Segregated equipment drop-areas.
- Remove disposable outer booties (when used).
- Remove chemical resistant outer gloves (when used).
- Remove hard hat, goggles-safety glasses-face shield (when used).
- Remove inner disposable gloves.

Level C

- Segregated equipment drop-areas.
- Remove disposable outer booties.
- Remove chemical resistant outer gloves.
- Remove chemical resistant coveralls.
- Remove first pair of disposable inner gloves.
- Remove respirator-hard hat-face shield.
- Remove second pair of disposable inner gloves.

Level B - NOT EXPECTED TO BE USED ON SITE

- Segregated equipment drop.
- Remove outer chemical resistant gloves.

  - Disconnect hose from regulator, change tank and;
  - Put on new gloves or reuse old gloves (if appropriate) and resume site activities; OR
  - Disconnect hose and remove face piece and SCBA harness, hard hat, etc.

- Remove outer disposable booties.

- o Remove chemical resistant disposable coveralls.
- o Remove inner disposable latex gloves.

Minimal equipment needed for decon: Level B: Stools, trash bags, tables (if possible), visqueen, garbage containers (2), water dispenser-spray bottle, etc.

All appropriate equipment shall be wrapped in plastic before beginning operations.

All disposable contaminated clothing will be collected and disposed of properly.

11.2 EQUIPMENT DECONTAMINATION

It is not anticipated that equipment decontamination will be required as only drinking water wells (residential, municipal, and industrial) will be sampled.

12.0 CONTINGENCY PLANNING

12.1 MEDICAL EMERGENCIES

Emergency communications will be maintained during all on-site field activities. Emergency numbers and routes are detailed in this plan and should be posted in the support zone. If an emergency occurs such as fire or explosion, all on-site personnel should exit the site in an upwind manner and assemble off-site. If an on-site injury occurs, the following should take place.

Worker Injury

If an employee working in a contaminated area is physically injured, Red Cross first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, they will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed (if possible), and transportation to local emergency medical facility awaited.

Injury/Exposure Incidents:

If the injury to the worker is chemical in nature the following first aid procedures are to be instituted as soon as possible:

a. Eye Exposure - If contaminated solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash stations using large amounts of water and lifting the lower and upper lids occasionally. Obtain medical attention immediately. (Contact lenses are not permitted in the Exclusion or Decontamination Areas.)

b. Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash contaminated skin using soap or mild detergent and water. If solids or liquid penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately if symptoms warrant.

c. Breathing - If a person breathes in large amounts of organic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

d. Swallowing - If contaminated solid or liquid has been swallowed, obtain medical attention immediately, and call the Poison Control Center.

A list of chemicals likely to be found on-site is contained in Section 2.0 of this site safety plan. First aid treatment for exposure to each of the chemicals will be kept on site. The SHSC will notify all on-site personnel of the location of the Safety Plan and first aid equipment.

Major Accidents

Major accidents which pose a potential immediate threat to life, limb, or health shall be handled in the following manner:

a. The necessary emergency response services (ambulance, fires, hospital, position control center) shall be notified, as well as the appropriate CDM personnel.

b. Other person(s) threatened by the accident will evacuate the area and operations in the areas of the incident will cease until approval to resume is given by the SHSC.

c. The SHSC will contact the RHSS and the site manager as soon as possible. The site manager will in turn inform the site project officer at IEPA of the accident and a written report detailing the accident, its causes, and consequences shall be submitted to the CDM Health and Safety Manager within 48 hours of the incident.

Emergency Evacuation

In the event of an emergency situation requiring evacuation of field personnel working within the designated Exclusion Zone, the following procedures will be followed:

a. The Site Health and Safety Coordinator will signal to evacuate through the use of air horns (2 sharp blasts).

b. All personnel leaving the Exclusion Zone will proceed directly through the Contamination Reduction Zone through the access control point and will decontaminate to the extent possible without a delay that will pose an unreasonable risk to the safety of on-site personnel.

ALTHOUGH NOT ANTICIPATED DURING SITE ACTIVITIES:
CONTINGENCY PLAN FOR A SPILL OF HAZARDOUS MATERIALS

In the event of a spill, the following steps should be taken:

1. Initially back away from the situation. Donn additional Personal Protective Equipment if necessary.

2. CONTROL and CONTAIN the spill or leak to the best of your ability using equipment available to you, i.e., dike the spill material, cover with dirt or visqueen, etc.

3. For any quantity - as soon as possible, call Illinois Emergency Services and Disaster Agency (IESDA) at 1-800-782-7860 and report the spill with relevant information.

4. After reporting the incident ask IESDA to transfer you to the Emergency Response Unit (ERU), Springfield, for assistance. Your first hand report may be needed to allow ERU to take appropriate action to further control the incident.

12.2 FLAMMABLE CONDITIONS

Due to presence of ppb levels of contaminants in groundwater only, and the fact that the types of contaminants present are essentially non-flammable, THERE WILL BE NO MONITORING FOR FLAMMABLE VAPORS. If, however, the OVA shows higher levels of vapors than previously thought, a combustible gas/oxygen meter will be brought to the site.

In the event that vapors exceed 20% of the LEL, AND/OR oxygen levels are less than 19.5%, the following actions should be taken:

- o Remove personnel away until vapors subside.
- o Consult with IEPA Emergency Response Unit.
- o Consult Rockford Fire Department.

Provide responding personnel with the call back number, location, directions, and situation assessment.

In the event vapors exceed 20% of the LEL proceed with CAUTION.

12.3 EMERGENCY TELEPHONE NUMBERS

Illinois Emergency Services and Disaster Agency - (217) 782-7860

Illinois Environmental Protection Agency

Emergency Response Unit -- (217) 782-3637
Land Pollution Control Division -- (217) 782-6760 or 782-6761
Camp Dresser & McKee -- Chicago Office (312) 786-1313

SITE TELEPHONE located: Hydrogeologic Unit is presently trying to purchase a mobile/transportable telephone. If this piece of equipment is purchased before site operations begin, then this will be used for offsite communications. If not purchased, since sampling will be conducted at private residences, telephones will be readily available if emergency support systems such as the fire department or ambulance service is needed.

HOSPITAL - EMERGENCY/TRAUMA

Address: Swedish American Hospital
1400 Charles Street
Emergency — (815) 961-2430
Non-Emergency — (815) 968-4400
Poison Control Center — (815) 968-6000

Proceed East or West on Harrison Avenue (Direction is dependent on location of Drill Rig) to 11th Street. Proceed North approximately 1.5 miles to Charles Street. Turn left (NE). Proceed two blocks and the hospital will be located on the right side of the street.

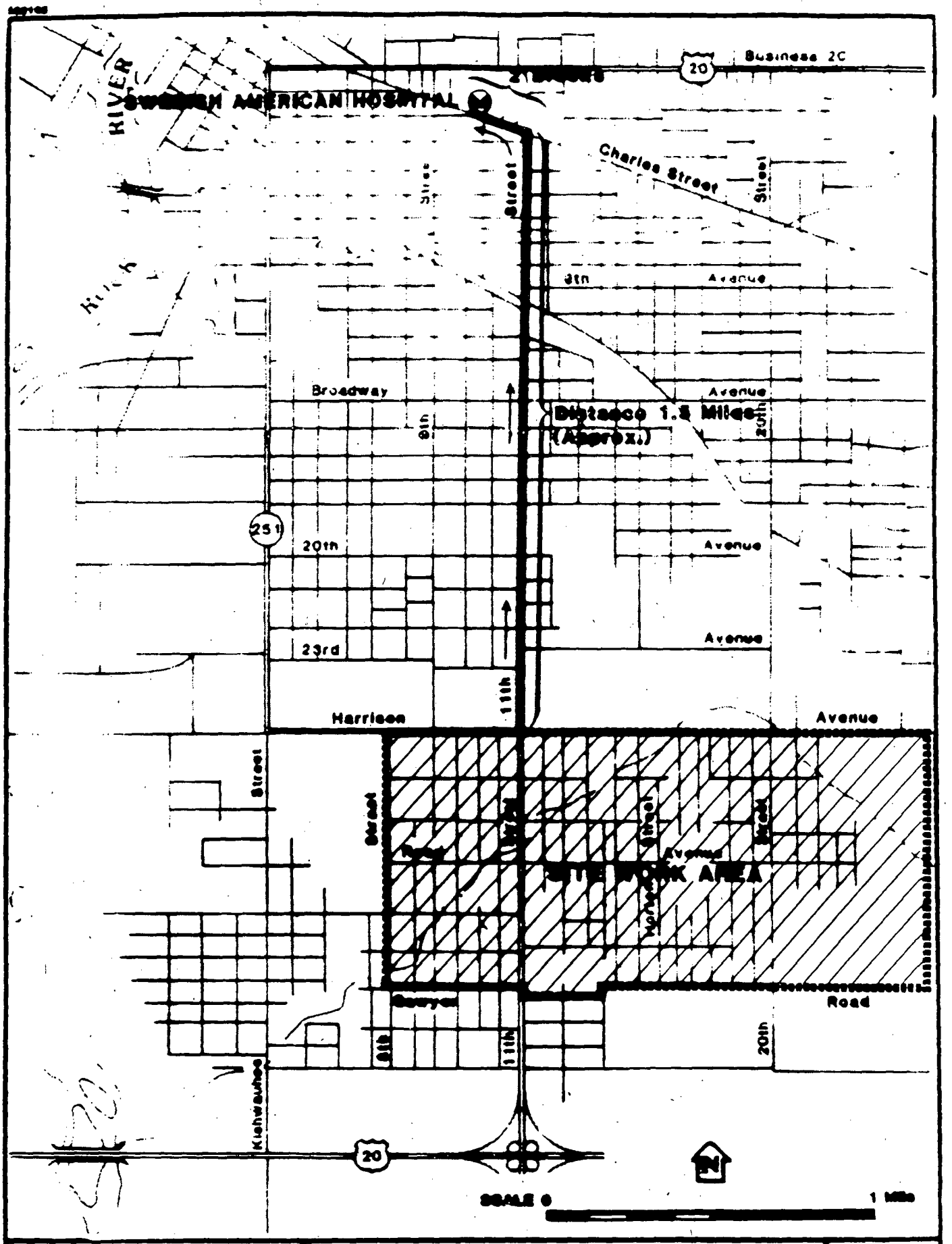
See route map for further assistance. This route shall be driven and verified prior to the initiation of site activities.

POLICE DEPARTMENT — (815) 987-5800

FIRE DEPARTMENT — Emergency Number: (815) 987-5800
General Dispatcher

Non-Emergency Number: (815) 987-5645

AMBULANCE — Metro Ambulance Inc.
(24 Hour) (815) 877-7277
or
Swenson Ambulance Service
(815) 877-4177



CDM

environmental engineers, scientists, planners, & management consultants

EMERGENCY HOSPITAL ROUTE MAP

FIGURE NO.

APPENDIX A

HEAT AND COLD STRESS

SECTION 9.0 HEAT AND COLD STRESS

9.1 Introduction

Stress can contribute significantly to accidents or harm workers in other ways.

The term stress denotes the physical (gravity, mechanical force, heat, cold, pathogen, injury) and psychological (fear, anxiety, crises, joy) forces that are experienced by individuals.

The body's response to stress occurs in three stages:

- **Alarm reaction** in which the body recognizes the stressor and the pituitary-adreno-cortical system responds by increasing the heart rate and blood sugar level, decreasing digestive activity and dilating the pupils.
- **Adaptive stage** in which the body repairs effect of stimulation and the stress symptoms disappear.
- **Exhaustion stage** in which the body can no longer adapt to stress and individual may develop emotional disturbances, and cardiovascular and renal diseases.

The most common types of stress that affect REM II field personnel are heat stress and cold stress. Current thinking is that heat and cold stress may be the most serious hazard to workers at wastes sites.

9.2 Heat Stress

Heat stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses that hazardous waste sites, regular monitoring and other preventative measures are vital.

REM II site workers must learn to recognize and treat the various forms of heat stress.

The best approach is preventative heat stress management. In general:

- Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposible, 4 ounce cups, and water that is maintained at 50 - 60°F. Urge workers to drink 1 - 2 of these cups water every 20-minutes, for a total of 1 -2 gallons per day. Provide a cool, preferably air conditioned area for rest breaks. Discourage the use of alcohol in non-working hours, and discourage the intake of coffee during working hours. Monitor for signs of heat stress.
- Acclimate workers to site work conditions by slowly increasing workloads, ie., do not begin site work activities with extremely demanding activities.

- Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
- Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.
- In hot weather, conduct field activities in the early morning or evening.
- Ensure that adequate shelter is available to protect personnel against heat, as well as cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.
- In hot weather, rotate shifts of workers wearing impervious clothing.
- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

9.3 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body - the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- Symptoms: Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely *high* body temperature, rapid respiratory and pulse rate; unconsciousness or coma.
- Treatment: Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool but not cold water, sponge the body with cool water, or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea or alcoholic beverages.

9.4 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- Symptoms: Pale, clammy, moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.
- Treatment: Remove the person to a cool, air conditioned place, loosen

clothing, place in a head-low position, and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 - 2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be about 1 - 2 gallons per day.

9.5 Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- **Symptoms:** Acute painful spasms of voluntary muscles; e.g., abdomen and extremities.
- **Treatment:** Remove victim to a cool area and loosen clothing. Have patient drink 1 - 2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be 1 - 2 gallons per day. Consult with physician.

9.6 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

- **Symptoms:** Mild red rash, especially in areas of the body in contact with protective gear.
- **Treatment:** Decrease amount of time in protective gear, and provide powder to help absorb moisture and decrease chafing.

9.7 Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70°F.

- Measure Heart Rate (HR). Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.

- **Measure Body Temperature.** Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99.6° F. If it does, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the OT exceeds 99.6°F at the beginning of the next period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6 F.
- **Manage Work/Rest Schedule.** The following work/rest schedule shall be used as a guideline:

Adjusted Temperature (°F)	*Active Work Time (min/hr) Using Level B/C Protective Gear*
75 or less	50
80	40
85	30
90	20
95	10
100	0

Calculate the adjusted temperature:

T (adjusted) = T (actual) + (13 x fraction sunshine)

Measure the air temperature with standard thermometer. Estimate fraction of sunshine by judging what percent the sun is out: 100% sunshine = no cloud cover = 1.0; 50% sunshine = 50% cloud cover = 0.5; 0% sunshine = full cloud cover = 0.0).

Reduce or increase the work cycle according to the guidelines under heart rate and body temperature.

9.8 Cold Stress

Persons working outdoors in low temperatures, especially at or below freezing are subject to cold stress. Exposure to extreme cold for a short time causes severe injury to the surface of the body, or results in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible.

Protective clothing generally does not afford protection against cold stress. In many instances, it *increases* susceptability.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-p tective equipment is removed if the clothing underneath is perspiration soaked.

9.9 Frostbite

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized into:

- **Frost nip or incipent frostbite** is characterized by sudden blanching or whitening of skin.
- **Superficial frostbite** is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- **Deep frostbite** is characterized by tissues that are cold, pale, and solid.

To administer first aid for frostbite: Take the victim indoors and rewarm the areas *quickly* in water that is between 39°C and 41°C (102°F-105°F). Give a warm drink - not coffee, tea or alcohol. The victim must not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help.

Note:

- Do *not* rub the frostbitten part (this may cause gangrene).
- Do *not* use ice, snow, gasoline or anything cold on the frostbitten area.
- Do *not* use heat lamps or hot water bottles to rewarm the part.
- Do *not* place the part near a hot stove.

9.10 Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F
- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

As a general rule field activities shall be curtailed if equivalent chill temperature (°F) as defined in Exhibit 9-1 is below zero (0°F) unless the activity is of an emergency nature.

EXHIBIT 9-1: Cooling Power On Exposed Flesh Expressed As An Equivalent Temperature Under Calm Conditions

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
Trenchfoot and immersion foot may occur at any point on this chart.												

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

SOURCE: ACGIH, Threshold Limit Values for Chemical Substances in the Work Environment for 1984-1985.

APPENDIX B

RESPIRATORY SELECTION PROGRAM

SECTION 6.0 RESPIRATORY PROTECTION PROGRAM

6.1 Introduction

This section describes the CDM Respiratory Protection Program. This program is structured to comply with applicable government and professional organizational guidelines and standards. Specifically, the appropriate regional/subsidiary HSM is required to ensure that the respiratory protection program is in compliance with the following for sites and operations under his/her control:

- OSHA 29 CFR 1910.134, Respiratory Protection Standards
- ANSI 288.2 - 1980. Practices For Respiratory Protection. ANSI, 1430 Broadway, New York, New York, 10018
- NIOSH Respirator Decision Logic. National Institute for Occupational Safety and Health (NIOSH)

Respirators shall be used only by authorized personnel, who are properly trained and fitted for the specific respirator. Each person who is involved in Level A, B, or C activities, or Level D activities in which an upgrade in level of protection is anticipated, must obtain Respirator Clearance as explained in Section 6.2. Unauthorized use of a respirator constitutes a violation of CDM health and safety policy and is subject to disciplinary action.

All respiratory protection equipment used carry the appropriate NIOSH approvals, and must be listed in the NIOSH Certified Equipment List, NIOSH DHHS (NIOSH) Publication #87-102, October, 1986.

6.1.1 Respirator Protection Factor

For the purposes of this manual, the respirator Protection Factor (PF) is defined as:

$$PF = \frac{\text{concentration outside mask}}{\text{concentration inside mask}}$$

To determine protection factor needed (PFn):

$$PFn = \frac{\text{ambient concentration expected}}{\text{PEL or TLV, whichever is lower}}$$

Note that respirator cartridges and canisters have Maximum Use Concentrations (MUCs) which must **never** be exceeded.

6.2 Obtaining Respirator Clearance

In order to obtain Respirator Clearance, personnel must:

- be fit tested for the specific respirator (Section 6.7),
- be trained in the use of respirators (Section 7.0), and
- have the proper medical clearance (Section 4.0).

OBTAINING RESPIRATOR CLEARANCE

CDM Respiratory Protection Program

A. **CONTACT** the **regional/subsidiary Health and Safety Manager** (HSM) and schedule a *Respirator Fit Test* with a CDM **approved** Respirator Fit Examiner. (See Appendix B)

B. **COMPLETE EMPLOYEE INFORMATION** (Name, Social Security Number, Firm, Firm Address and Telephone Number) on the *Respirator Fit Test Worksheet* (Exhibit 6-2), and **SIGN** the bottom of the worksheet.

C. **BRING WORKSHEET TO THE TEST.** The Examiner will complete and sign the worksheet, and submit it to the HSM. The HSM will submit the worksheet to CDM FPC so that the results can be entered into CDMHEALTH.

NOTE that Respirator Clearance is granted only after **signed** documentation from an approved Respirator Fit Examiner is received at CDM FPC.

ALSO NOTE that Respirator Clearance **only** does not permit CDM personnel to participate in site work activities. Personnel **must** also obtain Medical Clearance and Site/Activity Clearance.

Respirator Fit Testing is routinely conducted during CDM *Basic Health and Safety Training (CDM 150.4).*

Refer to Exhibit 6-1. Medical clearance is required to qualify for training and fitting. A listing of personnel who have been approved for respirator use and who have been fitted will be maintained on the CDMHEALTH database.

A summary of all test results shall be maintained for as part of the individuals permanent medical file. The *Respirator Fit Test Worksheet* (Exhibit 6-2), or equivalent, shall be used, to document fit test results.

6.2.1 Facial Hair

CDM personnel and subcontractors are not permitted to have facial hair (beards, sideburns, etc.) that interferes with the sealing surface of a respirator. A "one day" growth of facial hair is considered to interfere with respirator seal. Respirators cannot be used if there is any hair between the skin and the respirator sealing surface.

6.3 Level C Respiratory Protection: Air Purifying Respirators (APRs)

6.3.1 General

In most instances where the use of an APR is required for field activities, the full face MSA Ultratwin chemical cartridge respirator equipped with GMC-H cartridges is used. Other respirators and cartridges may be required for specific applications. The HSP must specify the respirator and chemical cartridge to be used.

Other makes and models of respirator may be used with the approval of the appropriate HSM if an individual cannot obtain an adequate face seal (pass a fit test) using the Ultratwin. Other types may be used with the approval of the appropriate HSM if the HSP specifies an alternate respirator, such as a half mask.

APRs can be used only in specific instances. In general:

- APRs should only be used when the chemical contaminants have been identified and quantitatively measured, and the proper cartridge specified. APRs may be selected using ambient air monitoring as explained in Sections 11.0 and 12.0. The HSM can be consulted regarding proper cartridge selection.
- APRs may *not* be used in atmospheres containing less than 19.5% oxygen, or in atmospheres exceeding the IDLH of any contaminant.
- APRs may *not* be used in atmospheres that exceed the Maximum Use Level (MUL) for the air purifying element (e.g. 1,000 for organic vapors).
- APRs may *not* be used when the Protection Factor is greater than the standard PF assigned to the type of facepiece. The standard PF for the Ultratwin respirator is considered to be 50.
- APRs shall *not* be used in atmospheres containing toxic compounds with poor warning properties, i. e. those that cannot be easily detected by odors or irritations. For example, they should not be used to protect against methyl chloride or hydrogen sulfide. The former is odorless and the latter, while foul-smelling, paralyzes the olfactory nerve so quickly that odor detection is unreliable. Appendix F lists warning properties of common chemicals.

RESPIRATOR FIT TEST WORKSHEET

CDM Respiratory Protection Program

NAME _____

SOCIAL SECURITY NUMBER _____

FIRM/REGION _____

Clean Shaven? YES NO **Spectacle Kit Required?** YES NO

Test Atmosphere:	*Isoamyl Acetate*		*Irritant Smoke*	
Test Atmosphere Recognition:	pass	fail	pass	fail
Manufacturer/Model: MSA/Ultratwin				
	pass	fail	pass	fail
Size: S M L				
Result: ACCEPTED REJECTED				

Manufacturer/Model: _____

	pass	fail	pass	fail

Size: _____

Result: ACCEPTED REJECTED

COMMENTS:

I (examiner) certify that the above named individual has been qualitatively fit tested in accordance with the guidelines established by the CDM *Health and Safety Assurance Manual* and that the above information reflects the results of the test.

EXAMINER'S SIGNATURE _____ DATE _____

EMPLOYEE'S SIGNATURE _____ DATE _____

MSA ULTRATWIN INSPECTION AND CHECKOUT

1. Visually inspect the entire unit for any obvious damages, defects, or deteriorated rubber.
2. Make sure that the facepiece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment.
3. Inspect lens for damage and proper seal in facepiece.
4. Exhalation Valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve (which could cause leakage).
5. Inhalation Valves (two) - screw off cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place.
6. Make sure a protective cover lens is attached to the lens.
7. Make sure the speaking diaphragm retainer ring is hand tight.
8. Make sure that you have the correct cartridge.
9. Don and perform negative pressure test.

The steps to be followed for cleaning and disinfecting in the field are as follows:

- **Respirator Disassembly**. Respirators are taken to a clean location where the filters, cartridges or canisters are removed, damaged to prevent accidental reuse, and discarded.
- **Cleaning.** In most instances, the cleaning and disinfecting solution provided by the manufacturer is used, and is dissolved in water in an appropriate tub. To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°, but it should not be less than 100°F to ensure adequate cleaning. Using gloves, the respirator is placed in the tub and swirled for a few moments. A soft brush may be used to facilitate cleaning.
- **Rinsing**. The cleaned and disinfected respirators are rinsed thoroughly in water (140°F maximum) in a separate tub to remove all traces of detergent and disinfectant, which can cause dermatitis.
- **Drying**. The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces.
- **Reassembly and Inspection**. The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. Special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

6.4 Level B Respiratory Protection: Self-Contained Breathing Apparatus (SCBAs) and Airline Respirators

6.4.1 General

SCBAs and airline respirators are used when APRs cannot provide sufficient protection (See Section 6.3.1). Personnel who have not been trained in the proper use of these devices must not use them.

In most field situations, an MSA 401/Ultralite positive pressure demand SCBA is used. It provides approximately 30 minutes of breathing time: less under extreme exertion. For longer periods of time, the standard MSA unit can be fitted with an airline attachment. Use of an airline requires additional training as well as the standard basic respirator training. Contact the appropriate HSM for guidance.

Other makes and models of SCBAs and airline respirators may be used if warranted. However, in all cases, they shall be positive pressure demand units. The appropriate HSM is required to specify the use of alternate brands in the HSP.

Refer to Sections 11.0 and 12.0 for a discussion on the criteria for determining when SCBAs and airline respirators are to be used based on ambient air monitoring.

MSA 401 / ULTRALITE SCBA INSPECTION & CHECKOUT

Monthly Inspection:

1. Check cylinder label for current hydrostatic test date.
2. Inspect cylinder for large dents or gouges.
3. Inspect cylinder gauge for damage.
4. Complete routine inspection.
5. Fill out the appropriate records with results and recommendations.

Routine Inspection: *Perform immediately prior to donning or after cleaning.*

1. Before proceeding, check that the:

   - High-pressure hose connector is tight on cylinder fitting.
   - By-pass valve is closed.
   - Mainline valve is closed.
   - Regulator outlet is not covered or obstructed.

2. Backpack and harness assembly:

   - Visually inspect straps for wear, damage and completeness.
   - Check wear and function of belt.
   - Check backplate and cylinder holder for damage.

3. Cylinder and high pressure hose assembly:

   - Check cylinder to assure that it is firmly attached to backplate.
   - Open cylinder valve; listen or feel for leakage around packing and hose connection.
   - Check high pressure hose for damage or leaks.

(continued)

MSA 401 / ULTRALITE SCBA INSPECTION & CHECKOUT (continued)

4. Regulator:

- Cover regulator outlet with palm of hand.
- Open mainline valve.
- Note stoppage of air flow after positive pressure builds.
- Close mainline valve.
- Remove hand from regulator outlet.
- Open by-pass valve slowly to assure proper function.
- Close by-pass valve.
- Cover regulator outlet again with palm of hand.
- Open mainline valve.
- Note pressure reading on regulator gauge.
- Close cylinder valve while keeping hand over regulator outlet.
- Slowly remove hand from outlet and allow air to flow.
- Note pressure when low-pressure warning alarm sounds; it should be between 550 - 650 psi.
- Remove hand from regulator outlet.
- Close mainline valve.
- Check regulator for leaks by blowing air into regulator for 5-10 seconds. Draw air from outlet for 5-10 seconds. If a positive pressure or vacuum cannot be maintained there is a leak. DO NOT USE SCBA.

5. Facepiece and corrugated breathing hose:

- Inspect hand harness and facepiece for damage, serrations, and deteriorated rubber.
- Inspect lens for damage and proper seal in facepiece. Inspect exhalation valve for damage and dirt build-up.
- Stretch breathing hose and carefully inspect for holes and deterioration.
- Inspect connector for damage and presence of washer.
- Peform negative pressure test with facepiece donned.

6. Storage:

- Refill cylinder to 2216 psi.
- Close cylinder valve.
- Tightly connect high pressure hose to cylinder.
- Bleed pressure from high pressure hose by opening mainline valve.
- Close by-pass valve.
- Close mainline valve.
- Fully extend all straps.
- Store facepiece in a clean plastic bag for protection.

6.6 Storage Of Respirators

OSHA requires that respirators be stored in a way that protects against:

- Dust
- Sunlight
- Heat
- Extreme cold
- Excessive moisture
- Damaging chemicals
- Mechanical damage

Damage and contamination of respirators may take place if they are stored in a trunk, on a workbench, or in a tool cabinet or toolbox, among heavy tools, grease and dirt.

Store SCBAs in the cases and APRs in the plastic bags supplied by the manufacturer.

Respirators kept ready for non-routine or emergency use should be stored in a cabinet with individual compartments.

Place freshly cleaned facepieces in tightly sealed plastic bags until use. Keep them in a clean, dry location away from direct sunlight. Store them in a single layer with the facepiece in an undistorted position to prevent the rubber or plastic from taking a permanently distorted "set".

Individual workers need to develop a respect for respirators, which will be an automatic incentive to properly store them. Besides providing better assurance of adequate protection, this attitude will lower maintenance costs by decreasing damage.

6.7 Respirator Fit Testing

CDM personnel and subcontractors shall be fit tested for each specific type of respirator they are expected to use. CDM personnel are required to be fit tested by CDM approved fit test examiners. Appendix D lists approved CDM Respirator Fit Examiners.

The results of the fit test are recorded on the *Respirator Fit Test Worksheet* (Exhibit 6-2), or an equivalent form. Respirator Clearance (Section 6.2) is reflected on the CDMHEALTH database once the worksheet is received at CDM FPC, providing that the individuals have the proper training (Section 7.0), and have appropriate Medical Clearance (Section 4.6).

6.7.1 Respirator Fit Test Protocol

The following Respirator Fit Test Protocol is adapted from *OSHA 29 CFR 1910*. The Isoamyl Acetate (IAA) and Irritant Fume Procedures are described.

Beards, sideburns, and other facial hair that interfere with the respirator's sealing surface shall not be permitted during the fit test. Interfering facial hair must be removed prior to fit testing, and prior to any use of a respirator in the field. As a general guide, a "one-day" growth of beard is considered to interfere with proper respirator fit. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

6.7.2 Equipment

- MSA Ventilation Smoke Tube Assembly, MSA Part No. 5607.
- MSA Ventilation Smoke Tubes, MSA Part No. 5645.
- North Respirator Fit Test Ampules (0.5 cc isoamyl acetate each), North Part No. 7002.
- Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars).
- Odor-free water (e.g. distilled or spring water), at approximately 25°C.
- 100 cc graduated cylinder, or metric measuring cup.
- Eyedropper.
- Mirror.
- Two fit test chambers similar to a clear 55 gal drum liner suspended inverted over a 2 foot diameter frame. (the top of a plastic trash barrel works well). The top of the chamber should be about 6 inches above the test subjects head. The inside top center of each chamber shall have a small clip so that the IAA ampules can be attached. One chamber is designated as the IAA chamber, and the other as the irritant fume chamber.
- A selection of respirators equipped with combined organic vapor and acid gas cartridges (MSA GMC-H or equivalent).

6.7.3 Isoamyl Acetate (IAA) Fit Test Procedure

6.7.3.1 IAA Odor Threshold Screening

The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated.

The Isoamyl Acetate (IAA) Stock Solution is prepared by adding two ampules (1 cc) of isoamyl acetate to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

The Odor Test Solution is prepared in a 1-liter jar by placing 0.4 cc of the IAA Stock Solution into 500 cc of odor free water using a clean eyedropper. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

Test Blanks are prepared in two 1-liter jars by adding 500 cc of odor free water.

The Odor Test Solution and Test Blank jars shall be labeled 1 and 2 for jar identification. If the labels are put on the lids they can be periodically peeled, dried off and switched to maintain the integrity of the test.

The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2):

> *The purpose of this test is to determine if you can smell banana oil at a low concentration. The three bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Tell to the test conductor which bottle contains banana oil.*

If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA Fit Test Procedure may not be used.

If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

6.7.3.2 Respirator Selection

The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes, and, if applicable, different types from different manufacturers.

The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction **may not** constitute the subject's formal training on respirator use.

The test subject should understand that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape and, if fit properly and used properly, will provide adequate protection to different people.

The test subject holds each facepiece up to the face and eliminates those which obviously do not give a comfortable fit.

The most comfortable mask is donned and worn at least five minutes to assess comfort. All donning and adjustments of the facepiece shall be performed by the test subject without assistance from the test conductor or other person. Assistance in assessing comfort can be given by discussing the points below. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept in setting proper tension on the straps.

Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

- Positioning of mask on nose.
- Room for eye protection.
- Room to talk.
- Positioning mask on face and cheeks.

The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed.
- Strap tension.
- Fit across nose bridge.
- Distance from nose to chin.
- Tendency to slip.
- Self-observation in mirror.

The test subject shall conduct the conventional negative and, if possible, positive-pressure fit checks. Before conducting the negative or positive-pressure test the subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down, while taking a few deep breaths.

The test subject is now ready for fit testing.

After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, the respirator should be readjusted, or another model of respirator tried, and the fit test repeated.

6.7.3.3 IAA Fit Test

Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges that offer protection against organic vapors (MSA GMC-H or equivalent). The cartridges shall be changed at least weekly.

After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, to prevent general room contamination.

A copy of the *Fit Test Exercises* and the *Rainbow Passage* (Exhibit 6-5) shall be taped to the inside of the test chamber.

Three of the IAA ampules are broken and clipped to the top of the IAA chamber. They are replaced every 30 minutes.

Each test subject shall wear the respirator for at least 10 minutes before starting the fit test.

The subject enters the IAA chamber and performs the exercises described in Exhibit 6-4 for approximately five minutes.

If at any time during the test, the subject detects the banana-like odor of IAA, the test has been failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

If the test is failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber., and again begin the procedure described above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

When a respirator is found that passes the test, the subject breaks the face seal and takes a breath before exiting the chamber. This is to assure that the reason the test subject is not smelling the IAA is the good fit of the respirator facepiece seal and not olfactory fatigue.

If hair growth or apparel interfere with a satisfactory fit test, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit test. If a satisfactory fit test is still not attained, the test subject must try another brand of respirator. If the employee cannot pass a fit test with any of the available respirators, then a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus must be assigned to the employee for use on site.

If a test subject experiences difficulty in breathing during the tests, she or he shall be reexamined by a physician trained in respiratory diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

6.7.4 Irritant Fume Fit Test Procedure

6.7.4.1 Respirator Selection

Respirators shall be selected as described in 6.7.3.2 above.

6.7.4.2 Irritant Fume Fit Test

Irritant smoke can be irritating to the eyes. Thus, the irritant fume fit test procedure is not recommended for testing the fit of half masks, and should only be used to test the fit of full face respirators.

The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.

The test subject shall properly don the respirator selected as above, and wear it for at least 5 minutes before starting the fit test.

The test conductor shall review this protocol with the test subject before testing.

The test subject shall perform the conventional positive pressure and negative pressure fit checks, if possible. Failure of either check shall be cause to select an alternate respirator.

The test subject enters the irritant fume test chamber. The person conducting the test shall fill the test chamber with irritant smoke through a hole in the chamber at about face level.

The test subject shall be instructed to do the exercises described in Exhibit 6-5 while being challenged by the smoke. The exercises shall be performed for at least five minutes.

The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

If hair growth or apparel interfere with a satisfactory fit test. then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit test. If a satisfactory fit test is still not attained. the test subject must try another brand of respirator. If an employee cannot pass a fit test with any available respirator. then a positive-pressure respirator such as a powered air-purifying respirator. a supplied air respirator. or a self-contained breathing apparatus must be assigned to the employee for use on site.

If a test subject exhibits difficulty in breathing during the tests. she or she shall be referred to a physician trained in respiratory diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

6.7.5 Repeat Of Fit Test

Because the sealing of the respirator may be affected. qualitative fit testing shall be repeated when the test subject has a:

- Weight change of 20 pounds or more.
- Significant facial scarring in the area of the facepiece seal.
- Significant dental changes: i.e., multiple extractions without prothesis. or acquiring dentures.
- Reconstructive or cosmetic surgery.
- Any other condition that may interfere with facepiece sealing.

FIT TEST EXERCISES AND RAINBOW PASSAGE

Fit Test Exercises

- Breathe normally.
- Breathe deeply. Be certain breaths are deep and regular.
- Turn head all the way from one side to the other. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders.
- Nod head up-and-down. Inhale when head is in the full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest.
- Talk aloud and slowly by reading the Rainbow Passage.
- Jog in place.
- Breathe normally.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

QUALITY ASSURANCE PROJECT PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION
OPERABLE UNIT FINAL QUALITY ASSURANCE PROJECT PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
REMEDIAL PROJECT MANAGEMENT SECTION
FEDERAL SITE MANAGEMENT UNIT
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

JUNE 1990

PROJECT NO: 1681-3-CG-GEAD

16814/02.1

1.0 TITLE PAGE

QUALITY ASSURANCE PROJECT PLAN
OPERABLE UNIT
SOUTHEAST ROCKFORD SITE
ROCKFORD, ILLINOIS

MAY 1990

Approved By: _____ Date: 5/18/90
USEPA Region V
Remedial Project Manager

Approved By: _____ Date: 5/15/90
USEPA Region V
Quality Assurance Office

Approved By: _____ Date: 5/18/90
USEPA Region V
Illinois Project Officer

Approved By: _____ Date: 5/22/90
Illinois EPA
Project Manager

Approved By: _____ Date: 5/22/90
Illinois EPA
Quality Assurance Office

Reviewed By: _____ Date: 5/16/90
USEPA Region V
Director, Central
Regional Lab

Approved By: _____ Date: 5/24/90
Camp Dresser & McKee Inc.
Project Manager

Approved By: _____ Date: 6/3/90
Camp Dresser & McKee Inc.
QA/QC Manager

2.0 TABLE OF CONTENTS

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LIST OF ACRONYMS

CDM	Camp Dresser & McKee
CLP	Contract Laboratory Program
CRL	USEPA Central Region Laboratory
CRQL	Contract Required Quantitation Limits
EMSL	Environmental Measurements System Laboratory (USEPA)
FM	Field Manager
FS	Feasibility Study
HSP	Health and Safety Plan
IDPH	Illinois Department of Public Health
MCL	Maximum Contaminant Level
OVA	Organic Vapor Analyzer
PRS	Proposed Illinois Groundwater Quality Standards
QAC	Quality Assurance Coordinator
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAL	Remedial Action Level
RAS	Routine Analytical Services (CLP)
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager (USEPA)
RPO	Regional Project Officer (USEPA)
RSCC	Regional Sample Control Coordinator
SAP	Sampling and Analysis Plan
SAS	Special Analytical Services (CLP)
SDWA	Safe Drinking Water Act
SIPM	Site Investigation Procedures Manual
SM	Site Manager
SMO	Sample Management Office
SOP	Standard Operating Procedure
SOW	Statement of Work

LIST OF ACRONYMS
(Continued)

TAL	Target Analyte List
TAT	Technical Assistance Team
TCL	Target Compound List
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds
WA	Work Assignment

3.0 PROJECT DESCRIPTION

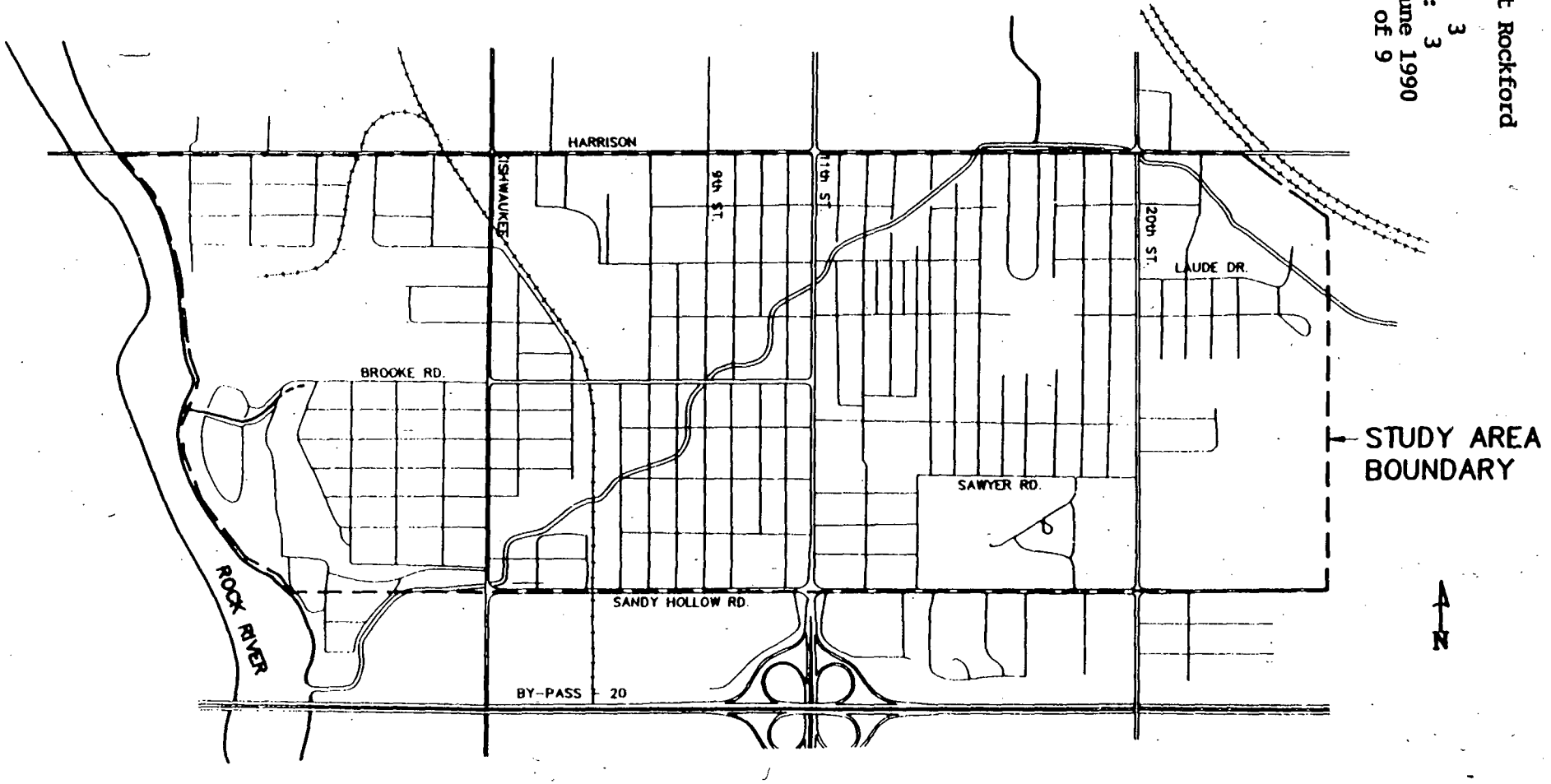
The Remedial Investigation portion of the Operable Unit is designed to gather specific information necessary to determine if the site presents a hazard to human health, welfare or the environment and to evaluate feasible remedial alternatives and/or the need for additional studies.

3.1 STUDY AREA BACKGROUND

The area of concern is located near Southeast Rockford in Winnebago County, and consists of approximately 2 to 3 square miles in Sections 1, 2, and 3, T43N, R1E and Section 6, T43N, R2E. The study area is bounded by Harrison Avenue to the north, Sandy Hollow to the south, the north-south center line of Section 6 to the east, and the Rock River to the west. The study area is shown in Figure 3-1.

The study area is predominantly an urban residential area that includes scattered retail and commercial operations. A small industrial park is located near the eastern boundary of the study area in the vicinity of Laude Drive. The study area is predominantly flat-lying and slopes gently westward toward the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief across the study area is approximately 120 feet. A small concrete-lined drainage ditch runs across the study area and discharges to the Rock River at the southwestern corner of the study area. A review of 117 Illinois Department of Public Health (IDPH) well construction reports indicated that the majority of the residential wells in the study area are screened in the 40-foot to 70-foot depth range in a sand and gravel aquifer. Although deeper residential wells are common in the study area, no systematic distribution of the deeper wells is evident.

The well construction reports reviewed were generally incomplete regarding stratigraphy and well construction information. The Southeast Rockford Phase I Remedial Investigation is currently in the planning stage and is



CDM
environmental engineers, scientists, planners, & management consultants

SCALE
0 0.5 MILES

SOUTHEAST ROCKFORD STUDY AREA

FIGURE NO.
3-1

designed to address area hydrogeologic information that is not addressed in this study. Information on well construction of the wells sampled will be gathered as part of this Operable Unit residential well sampling.

A summary of the existing geologic information, site history, and previous investigations is provided in Section 2.0 of the Work Plan. Appendix A of this QAPP contains a summary of the most recent (1988 and 1989) existing analytical data from previous sampling events. Based on the existing data, the following volatile organic compounds (VOCs) and metals have been targeted as contaminants of concern:

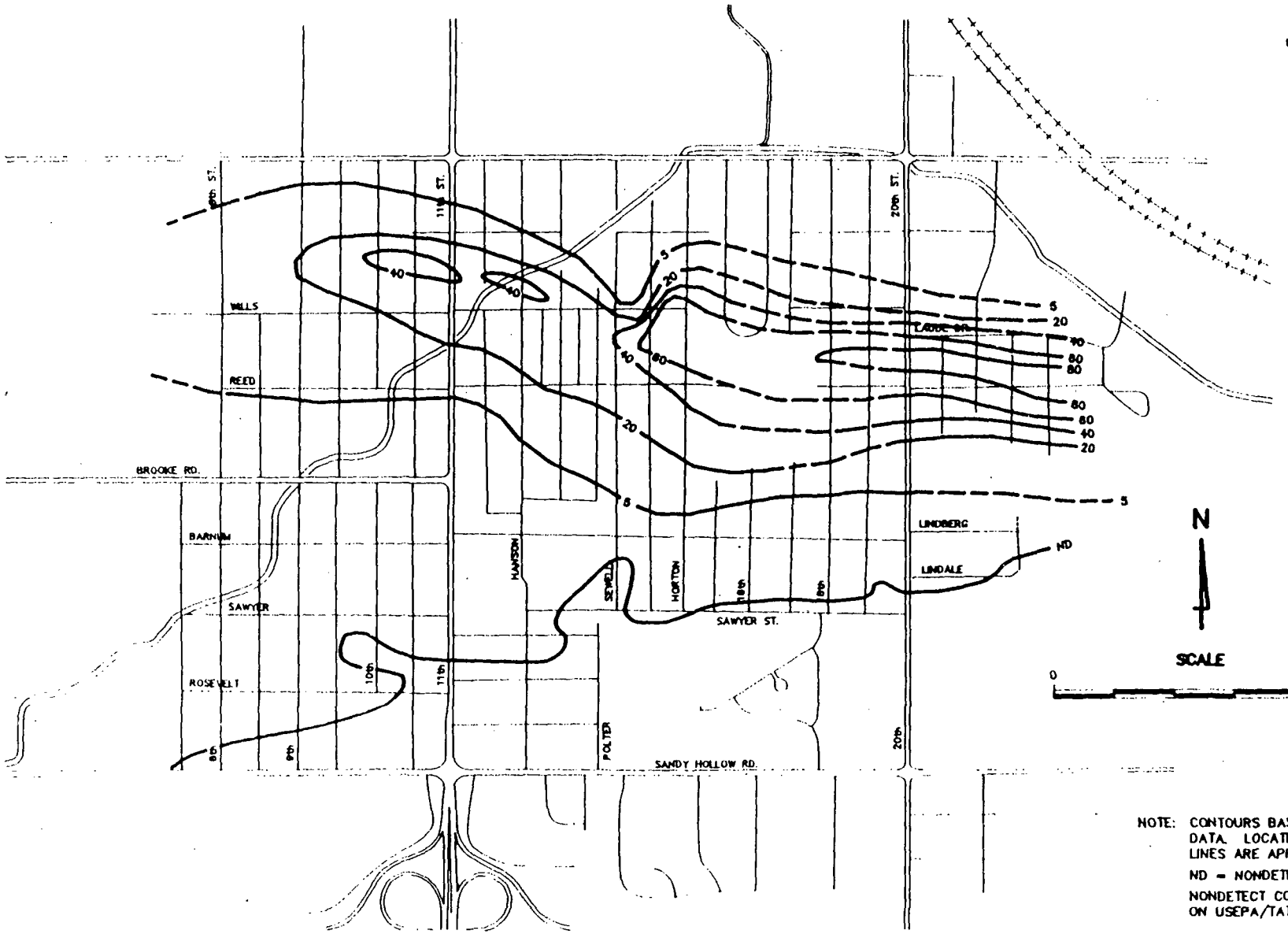
Trichloroethylene (TCE)
1,1,1-Trichloroethane (1,1,1-TCA)
Cis-1,2-Dichloroethylene (Cis-1,2-DCE)
Trans-1,2-Dichloroethylene (Trans-1,2-DCE)
1,1-Dichloroethylene (1,1-DCE)
Tetrachloroethylene (PCE)
1,1-Dichloroethane (1,1-DCA)
1,2-Dichloroethane (1,2-DCA)
Vinyl Chloride
Lead
Cadmium
Chromium
Arsenic

Of the contaminants listed above, Safe Drinking Water Act Maximum Contaminant Levels (MCLs) exist for the metals and TCE, 1,1,1-TCA, 1,1-DCE and 1,2-DCA. MCLs have been proposed for cis-1,2-DCE and PCE. Twelve of the above contaminants have been addressed in the Proposed Illinois Groundwater Quality Standards, the exception being 1,1-DCA. These compounds (except vinyl chloride) have been detected in the Southeast Rockford area and some have been found consistently at or above 50% of the MCL.

Most of these chemicals are products of each other through microbial degradation by sequential dehalogenation. TCE is an end product of PCE, cis-1,2-DCE is a degradation product of PCE, TCE, and 1,1,1-TCA; and 1,1-DCE is a final product of 1,1,1-TCA. (See Data Summary in Appendix A for further information.) Because these compounds are found at the site and are degradation products of one another, they can be used to help determine the source of contamination and are useful in providing insight into the fate and transport of the contamination. The VOCs that will be analyzed in the Operable Unit are those previously listed. Vinyl chloride is included because it is a possible degradation product, along with some of the other contaminants of concern.

The approximate area affected by the plume of VOC-contaminated groundwater based on the 1989 USEPA/TAT data, is shown with a plume concentration for TCE in Figure 3-2. Although the VOC plume contains other components in addition to TCE, TCE has been chosen as an indicator parameter to illustrate the general distribution of VOC-contaminated groundwater at the site. Review of USEPA/TAT data indicates that the other VOC contaminants in the study area have the same general distribution as the TCE plume shown in Figure 3-2.

Metals have been analyzed in only a limited number of samples in the Southeast Rockford Operable Unit study area (Data Summary, Appendix A). Chromium was detected during a 1984 investigation of illegal disposal activities in a well located near a metal plating company. Cadmium, arsenic and lead were detected during an IEPA routine sampling event in 1988 near Barrett's Mobile Home Park at Harrison and Marshall. Due to the fact that metals (primarily those listed) have been detected in all previous samples that were analyzed for metals, all of the samples collected from the study area will be analyzed for cadmium, chromium, lead and arsenic at Drinking Water Detection Limits.



NOTE: CONTOURS BASED ON 1989 USEPA DATA. LOCATIONS OF CONTOUR LINES ARE APPROXIMATE.

ND = NONDETECT

NONDETECT CONTOUR LINE BASED ON USEPA/TAT AND IDPH DATA.

CDM
environmental engineers, scientists, planners, & management consultants

TCE CONCENTRATION IN PRIVATE WATER WELLS (in ug/l)

FIGURE NO. 3-2

3.2 PROJECT OBJECTIVES AND DATA USAGE

The overall objective of this Operable Unit investigation is to determine which residences and industries outside the Removal Action area are affected or potentially affected by the groundwater contaminant plume and to develop and evaluate a cost-effective alternative for providing potable water to affected residents in a timely manner. In order to achieve this objective CDM will conduct residential, municipal and industrial well sampling. The data obtained from this sampling will be used in conjunction with existing USEPA/TAT and IDPH data to identify those residential and industrial wells in the study area that are contaminated at levels between the MCLs and method detection limits for the contaminants of concern.

In order to maximize data coverage, CDM's sample locations are concentrated outside of the known VOC plume area as defined by existing 1988 and 1989 data (areas that were not sampled during previous studies). Because there is very little existing metals data for the study area, no metals plume definition is possible at this time. Therefore, all samples collected will also be analyzed for the list of target metals previously discussed.

All sampling for this project will be from residential, industrial or municipal wells to evaluate the need for and extent of alternate water supply alternatives. The analytical data produced will be used for risk assessment and development, evaluation and design of alternatives. In order to allow for comparison of the data with applicable regulatory requirements (Safe Drinking Water Act Maximum Contaminant Levels) and human health criteria, Data Quality Objectives (DQO) Level V, Special Analytical Services Analyses are necessary for both metals and volatile organics to achieve detection limits that will allow for these comparisons. The Special Analytical Services requests for these analyses are contained in Appendix B.

3.3 SCHEDULE

The anticipated schedule for key activities in this Operable Unit is shown in Figure 3-3. Samples will be collected over a period of two weeks.

3.4 SAMPLING NETWORK

The scope of sampling for this Operable Unit includes the collection and analysis of 144 residential well samples, 10 industrial well samples and one municipal well sample for target metals and target volatile organics. Seventeen field duplicate samples and seventeen field blank samples will also be collected and analyzed for target metals and target volatile organics. One volatile organic trip blank will be shipped with each cooler of volatile organics. It is estimated that 15 trip blanks will be collected.

Table 3-1 is a summary of the sampling and analysis network and specifies the parameters to be measured, the number of samples to be collected, and the level of QC effort for each sample type.

All sampling and testing will conform to guidelines set forth in the User's Guide to the EPA Contract Laboratory Program. Sections 6 through 9 of the QAPP and Section 3 of the Sampling and Analysis Plan discuss the specific sampling and analytical procedures to be followed for this project. Section 2 of the Sampling and Analysis Plan describes sample locations and rationale.

FIGURE 3-3

SCHEDULE OF OPERABLE UNIT ACTIVITIES

FIGURE 3-3
SCHEDULE OF OPERABLE UNIT ACTIVITIES

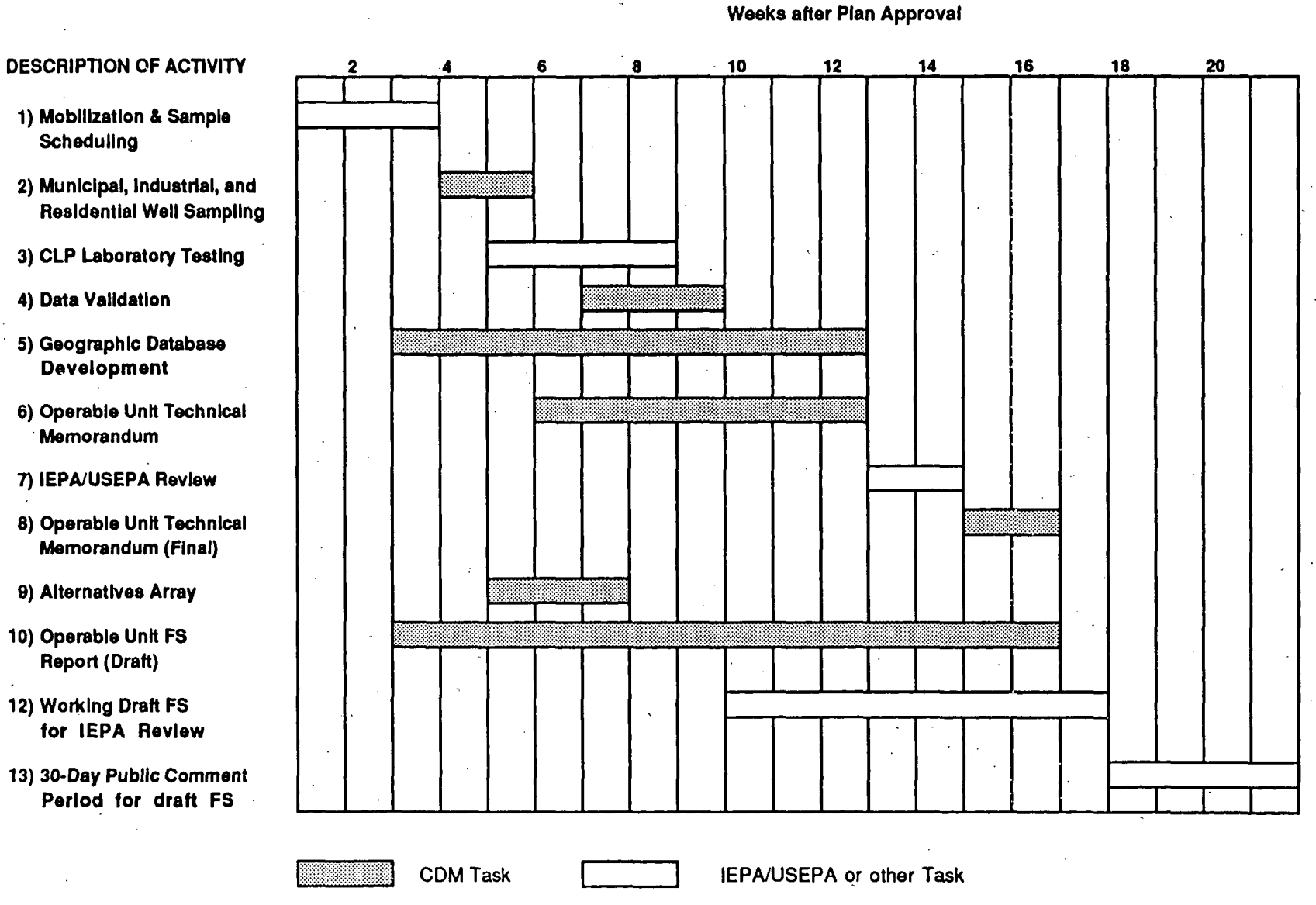


TABLE 3-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

			QA Samples								Matrix
			Investigative Samples			Field Duplicate			Field Blank		
Sample Matrix	Field Parameters	Laboratory Parameters	No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	Total
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	144	1	144	15	1	15	15	1	15	174
		SAS for metals[1/] from CLP	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	1	1	1	1	1	1	1	1	1	3
		SAS for metals[1/] from CLP	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile[1/] organics from CLP	10	1	10	1	1	1	1	1	1	12
		SAS for metals[1/] from CLP	10	1	10	1	1	1	1	1	1	12

A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

[1]CLP SAS volatile parameters are listed in Table 5-1 of the QAPP and in the SAS Request.

[2]CLP SAS metal parameters are listed in Table 5-2 of the QAPP and in the SAS Request.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Camp Dresser and McKee Inc. (CDM), as prime contractor, has overall responsibility for all phases of the Operable Unit and will therefore oversee the field investigations, prepare the Technical Memorandum and conduct a Feasibility Study. CDM will also provide QA/QC for all deliverables and provide for their issuance.

4.1 PROJECT ORGANIZATION

The project organization structure, Figure 4-1 shows the staff designations, assignments and lines of communication for the Operable Unit.

4.2 IEPA PERSONNEL

4.2.1 PROJECT MANAGER

The Project Manager, Mr. David Dollins, is responsible for overall management and coordination of technical and fiscal aspects of the Operable Unit. Mr. Dollins will serve as the IEPA contact for the USEPA Region 5 Project Manager.

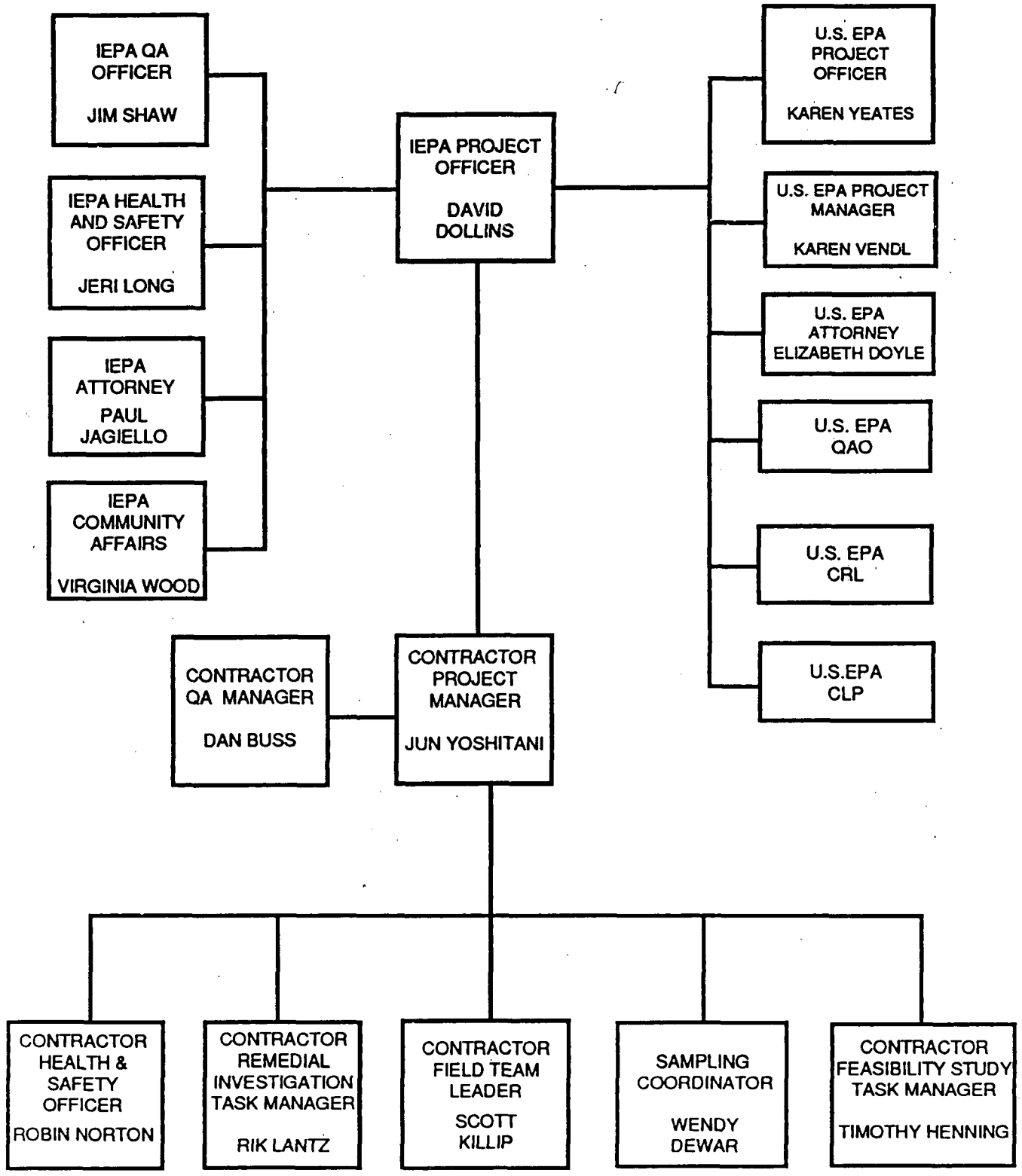
4.2.2 ATTORNEY

The Attorney, Mr. Paul Jagiello, is responsible for the legal aspects of the Operable Unit including site access and other legal issues that may arise.

4.2.3 QUALITY ASSURANCE OFFICER

The Quality Assurance Section Project Officer, Mr. Jim Shaw, is responsible for the QAPP technical review. Mr. Shaw is available for consultation on various QA/QC issues.

FIGURE 4-1
SOUTHEAST ROCKFORD OPERABLE UNIT
ORGANIZATION CHART



4.2.4 HEALTH AND SAFETY OFFICER

The Health and Safety Officer, Ms. Jeri Long, is responsible for the review of the Health and Safety Plan.

4.3 USEPA PERSONNEL

4.3.1 STATE PROJECT OFFICER

The USEPA State Project Officer, Ms. Karen Yeates, is responsible for federal oversight of state-lead activities for the state of Illinois.

4.3.2 REMEDIAL PROJECT MANAGER

The USEPA Region 5 Remedial Project Manager, Ms. Karen Vendl, is responsible for oversight of the entire Operable Unit at Southeast Rockford.

4.3.3 QUALITY ASSURANCE SECTION

The USEPA Region 5 Quality Assurance Section (MQAB/ESD) is responsible for review and approval of the QAPP.

4.3.4 LABORATORY TESTING ASSIGNMENTS

Liquid samples from residential, industrial and municipal wells will be analyzed by the laboratory described below:

- USEPA Contract Laboratory Program (CLP) will analyze water samples at drinking water levels as part of the Special Analytical Services (SAS) package.

4.3.5 LABORATORY QA/QC RESPONSIBILITIES

- o Contract Laboratory Program (CLP) Special Analytical Services (SAS)

  - Requests initiated by CDM Project Organization;
  - Requests coordinated through USEPA Region V Environmental Services Division or USEPA Region V Remedial Response Branch of USEPA Remedial Project Manager (RPM);
  - Review of SAS specifications - USEPA Region V QA Office and CRL; and
  - Final data review will be performed by Paul Patel and Bob Hank of CDM.

4.3.6 REGIONAL SAMPLE CONTROL COORDINATOR

The USEPA Region 5 Regional Sample Control Coordinator (RSCC) will be the contact point for the scheduling of CLP, SAS analyses. The RSCC will be responsible for training the CDM Field Team Leader in the use of the USEPA CLP and its associated paperwork.

4.4 CONTRACTOR PERSONNEL

CDM, as contractor to IEPA, will analyze the data generated by the Operable Unit field activities. CDM will be responsible for completion of tasks specified in the Statement of Work which includes the preparation of the Operable Unit Technical Memorandum.

4.4.1 PROJECT MANAGER

The Project Manager is responsible for day-to-day management and coordination of the contractor staff. This duty includes, but is not limited to, ensuring that all contractor and subcontractor staff understand

and comply with the QA/QC program. The Project Manager is responsible for the Work Plan and review of data generated from field measurements and activities. The Project Manager will also be responsible for preparing the Operable Unit reports.

4.4.2 PROJECT QUALITY ASSURANCE MANAGER

The CDM Quality Assurance Manager is responsible for providing specific QA support to the Project Manager and coordinates QA technical operations among task teams performing duties that are assigned to CDM during this Operable Unit.

5.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide legally defensible results in a court of law. Specific procedures to be used for sampling, chain-of-custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventive maintenance, and corrective actions are described in other sections of this QAPP. This section defines the goals for level of QA effort; accuracy, precision, and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data from all analytical laboratories. (Refer to the glossary for definitions of these terms, Section 16.0.) Quality assurance objectives for field measurements also are also discussed.

5.1 REGULATORY AND LEGAL REQUIREMENTS

The data obtained from analysis of the residential, public and industrial wells will be compared to the National Primary Drinking Water Standards (NPDWS). The method detection limits specified in the Special Analytical Services Requests (Appendix B) from the CLP are sufficiently low to allow this comparison for the compounds of concern. The required detection limits for the target volatile organic and metals analysis are presented in Section 5.3.

5.2 LEVEL OF QUALITY CONTROL

Replicate samples, field blanks, and trip blanks consisting of distilled, deionized water will be submitted to the analytical laboratories to provide the means to assess the quality of data resulting from the field sampling program. Duplicate samples will be analyzed to check for sampling reproducibility. Generally, field precision control limits are 30% RPD for water samples. If this is exceeded, the field sampling techniques will be

reviewed to determine possible causes of the discrepancy. Sample data will not be rejected on the basis of field duplicate discrepancies. Blank samples will be analyzed to check for procedural contamination and/or ambient conditions at the site that may cause sample contamination. The general level of this QC effort will be one field duplicate and one field blank sample per group of 10 or fewer investigative samples, one matrix spike/matrix spike duplicate (MS/MSD) sample per group of 20 or fewer investigative samples, plus 1 trip blank sample per shipping cooler of VOA samples. Extra volume will be necessary for liquid organic samples targeted for MS/MSD analysis: triple the normal volume for VOA analysis. No extra volume is required for metals.

The specific level of field QC effort for the Southeast Rockford Operable Unit is described in Section 5.0 of the Sampling and Analysis Plan (SAP) and is summarized by sample matrix and parameter in Table 3-1 in Subsection 3.4 of this QAPP.

The residential, municipal and industrial well water samples collected at the site will be analyzed using the USEPA CLP. The level of laboratory QC effort for SAS analysis provided by the CLP is specified on the SAS request forms (Appendix B) for organic and inorganic analyses.

The QC level of effort for the field measurement of pH consists of pre-measurement calibration and a post-measurement verification using two standard reference solutions as outlined in Appendix C. QC effort for field conductivity measurements will include daily calibration of the instrument using standard solutions of known conductivity as outlined in Appendix C.

5.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to accuracy, precision, and sensitivity (see Glossary of Terms for definitions, Section 17.0 of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for SAS from

the CLP are specified in the SAS request forms (Appendix B). The sensitivities required for SAS CLP analysis are given for each compound in the SAS request forms and are provided in Table 5-1 for VOCs and in Table 5-2 for inorganic analysis.

The accuracy of field measurements of pH will be assessed through pre-measured calibrations and post-measurements which must each be within ±0.01 pH units of the known standard buffer solution values. Precision will be assessed through replicate measures. (The electrode will be withdrawn, rinsed with deionized water, and re-immersed between each replicate. The calibration and verification will be done before the first replicate and after the last.) The instrument used will be capable of providing measurements to 0.01 standard unit. Accuracy of the conductivity meter will be assessed by a daily check of a standard solution. For field measurements of temperature, the accuracy of the thermometer will be checked in a water/ice slurry once, at the beginning of field activities. Calibration of field equipment will be performed in accordance with the calibration and maintenance procedures outlined in Appendix C.

5.4 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that the CLP will provide data meeting QC acceptance criteria for 95 percent or more of all samples tested. The CLP laboratory should provide data that are complete and valid. (For definition of completeness, representativeness and comparability see Glossary of Terms, Section 17.0.)

The sampling network was designed to provide data representative of site conditions. During development of this network, consideration was given to past waste disposal practices, existing analytical data, physical setting and processes. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in this QAPP, are expected to provide comparable data. These

TABLE 5-1

QUANTITATION LIMITS FOR SAS VOC
DRINKING WATER ANALYSIS

COMPOUND	METHOD DETECTION LIMIT (ug/l)
Trichloroethylene	0.50
1,1,1 Trichloroethane	0.50
1,1-Dichloroethylene	0.50
Tetrachloroethylene	0.50
1,2-Dichloroethane	0.50
1,1-Dichloroethane	0.50
Vinyl Chloride	0.50
Cis-1,2-Dichloroethylene	0.50
Trans-1,2-Dichloroethylene	0.50

TABLE 5-2

INSTRUMENT DETECTION LIMIT

COMPOUND	INSTRUMENT DETECTION LIMIT ug/l	
	GFAA	ICP
Metal		
1. Arsenic	2	
2. Cadmium	0.5	
3. Chromium		10
4. Lead	2	

new analytical data, however, may not be directly comparable to existing data because of differences in procedures and QA objectives.

5.5 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- Documenting time and weather conditions;
- Locating and determining the elevation of sampling stations;
- Determining pH and temperature of water supply;
- Determining depths in a borehole or well; and
- Verifying well development and pre-sampling purge volumes.

The general QC objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the SAP.

The precision and accuracy of pH and conductivity measurement will be assessed in the field prior to analysis. The calibration of field instruments will be conducted at the beginning of the day prior to their use. The calibration of the pH meter (Appendix C) will be performed by taking two measurements on each of two standard buffer solutions of pH 4 and pH 7. The accuracy will be determined by the difference in replicate samples of the standard pH buffer solutions. These measurements should be within $\pm$0.1 pH units from the value of the standard solutions. Replicate

analysis will be completed on all three standards and the difference between the replicates will be within ±0.1 standard pH units of the known value of the standard buffer solution. The precision will be less than or equal to 0.1 difference between the two measurements on each pH standard buffer solution. If the pH meter fails to calibrate properly, a different pH meter will be calibrated and used.

The calibration measurements made for the specific conductance will be used to assess the accuracy and precision. The calibration of the instrument will be made by making two measurements on a standard. The accuracy will be within 10 percent of the standard value and precision will be less than or equal to 15 percent of the difference between the two replicate measurements of the standard. If the measurements are not within ± 10 percent of the standard or are not reproducible within ± 15 percent, the instrument will be returned to the manufacturer for maintenance and calibration.

The level of QC for the thermometer will consist of a calibration check using an ice/water slurry once at the beginning of field activities. The thermometer must read within ± 1°C of 0°C. If the thermometer is out of calibration, it will be replaced.

6.0 SAMPLING PROCEDURES

Procedures to sample municipal, industrial and residential drinking water wells are described in the SAP. Also included are descriptions of sampling containers, sample preservation techniques, procedures for sample bottle and sampler decontamination, sample documentation, packaging and shipping. The sample containers will be four 40 ml VOA vials. They will be preserved by cooling with ice to 4° C. The containers will be filled completely and have no air space or bubbles. The maximum allowable holding time is 5 days. The sample container required for metals is one 1-liter high density polyethylene bottles (unfiltered) for a water matrix. Bottles will be filled to the shoulder and preserved with 5-ml 1:1 HNO_3 to pH<2. The maximum holding time is 6 months for the metals of concern.

The Southeast Rockford Operable Unit will use the IEPA Sample Bottle Program. Sample containers will be prepared as specified in the IEPA Exhibit A, Scope of Work for FY90, Sample Bottle Supply Service (Appendix D). The IEPA sample bottle contractors' quality control data generated for the lots used in this project will be available upon request. This data may be obtained from the contractor through the IEPA Project Manager.

7.0 SAMPLE CUSTODY

7.1 INTRODUCTION

It is USEPA and Region V policy to follow the USEPA Region V sample custody or chain-of-custody protocols as described in "NEIC Policies and Procedures", EPA-330/9-78-001-R, revised May 1986. This Custody is in three parts: sample collection, laboratory, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if the documents:

- o are in your possession;
- o are in your view, after being placed in your possession;
- o were in your possession and you placed them in a secured location; or
- o are in a designated secure area.

7.2 FIELD-SPECIFIC CUSTODY PROCEDURES

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

Field procedures are as follows:

(a) The field sampler will be personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.

(b) All bottles will be tagged with sample numbers and locations. If applicable, the Sample Management Office (SMO) number and stickers will be affixed.

(c) Sample tags will be completed for each sample using waterproof ink unless prohibited by weather conditions. If prohibited, a logbook notation would note that a pencil was used to fill out the sample tag because the ballpoint would not function in freezing weather.

(d) The contractor's site manager will review all field activities to determine whether proper custody procedures were followed during the field work and decide if additional samples are required. He or she should notify the Project Manager of any breach or irregularity in chain-of-custody procedures.

Transfer of custody and shipment procedures are as follows:

(a) Samples will be accompanied by an accurately completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.

(b) Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and secured with strapping tape and EPA custody seals for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front

right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

(c) Whenever samples are split with a source or government agency, a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavilable or refuses, this should be noted in the "received by" space.

(d) All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment; the pink and yellow copies will be retained by the sampler for return to the sampling office.

(e) If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

7.3 LABORATORY CUSTODY PROCEDURES

The chain-of-custody procedures for CLP are described in the Statement of Works (SOWs) for Routine Analytical Services (RAS). This same custody procedure applies to Special Analytical Services (SAS). These custody procedures along with the holding time requirements for CLP samples are described in the appropriate SOW documents.

7.4 FINAL EVIDENCE FILES CUSTODY PROCEDURES

The final evidence files from the CLP Laboratory are maintained by the Region V CRL Laboratory Support Team Data Coordinator.

The contractor will maintain the site files along with all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and the data and data reviews of the CLP generated laboratory data in a limited access area and under custody of the contractor's Site Manager.

The final evidence file will include, but not be limited to:

- Project Plans
- Field Data Records
- Logbooks
- Sample Tags
- Chain-of-Custody Records
- Sample Tracking Records
- Analytical Logbook Pages
- Bench Sheets
- Instrument Readout Records
- Computer Printouts
- Graphs
- Calculations
- Raw Data Summaries
- Data/Purge Files
- Correspondence
- Data Validation Files and Reports
- Report Notes
- Miscellaneous-Photos, Maps, Drawings, etc.
- Final Report

Upon completion of the project, the evidence files, in their entirety, will be turned over to IEPA for archiving.

8.0 CALIBRATION PROCEDURES AND FREQUENCIES

As an activity that affects data quality, instrument calibration must be performed in accordance with formal written procedures. The instrument must be calibrated and maintained by trained personnel to operate within manufacturer's specifications. Field instruments will be calibrated prior to any measurements taken in the field. Field instruments will be recalibrated if found to be necessary during routine QC checks. Subsection 14.2.2 discusses calibration of field instruments. The calibration procedures for laboratory analytical equipment will be maintained within the criteria established in the appropriate SAS Client Request Forms provided in Appendix B as discussed in Subsection 14.1.2.

9.0 ANALYTICAL PROCEDURES

For the Southeast Rockford Operable Unit study, the analytical procedures for CLP Laboratory are discussed in Subsection 14.1.1 of the QAPP. Analytical procedures for field analytical equipment are discussed in the SAP and in Subsection 14.2.1 of the QAPP.

10.0 INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks for field instruments are discussed in Subsection 14.2.3. If any field instrument fails the QC checks for calibration it will be recalibrated, repaired, or replaced, whichever is necessary. Quality control checks for laboratory instrumentation are discussed in Subsection 14.1.3 and detailed in the SAS Client Request Forms provided in Appendix B.

11.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, validation and reporting will be performed in accordance with the general requirements of the USEPA CLP. Specific data reduction, validation and reporting requirements for the Southeast Rockford Operable Unit Technical Memorandum will be discussed in Section 14.

12.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits may be conducted for activities performed by any entity performing services on this project, including CLP laboratories, CRL and field team activities.

Performance and systems audits of field activities may be performed periodically by the CDM QC Manager in accordance with CDM audit procedures, the USEPA Region V Environmental Services Division or the IEPA Project Manager. Audits will be performed to evaluate sampling activities including sample ID, chain-of-custody, field documentation and sampling procedures. The results of the field audits will be reported as part of the Quality Assurance Reports to management.

The performance and systems audits for analytical and field data are described in Section 14.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance for field instruments and laboratory analytical equipment is discussed in Section 14 of this QAPP.

14.0 ANALYTICAL SERVICES

General programmatic requirements for analytical procedures are established in the CDM Quality Assurance Program Manual. This program establishes the need for formally documented procedures which require:

- The use of CLP laboratories and analytical procedures for all enforcement, litigation, and evidentiary data,

and

- The specification of analytical procedures for all analytical field procedures and non-CLP generated data.

14.1 SPECIAL ANALYTICAL SERVICES

14.1.1 LABORATORY PROCEDURES

The analytical procedures to be used for performing the SAS analyses are described in the SAS requests in Appendix B. Also specified in the SAS requests are calibration procedures, frequency of calibration and the internal quality control checks required for each analysis. The SAS specifications also include the types of audits required (sample spikes, surrogate spikes, reference samples, control blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

14.1.2 CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures for laboratories participating in the CLP are specified under the program and will insure proper calibration of instruments used to analyze samples shipped to those laboratories. The

specific calibration procedures for the SAS methods to be used for this project are specified in the SAS requests in Appendix B.

14.1.3 INTERNAL QUALITY CONTROL CHECKS

There are two types of quality assurance mechanisms used by the CLP to ensure the production of analytical data of known and documented usable quality: analytical method quality control (QC), and program quality assurance (QA). The internal quality control procedures for routine analytical services from CLP are specified in the SOWs for organic (SOW-2/88) and inorganic (SOW-7/88) analyses. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

For this project, the specific internal quality control checks as modified from those specified in the SOWs are described in the SAS requests in Appendix B.

14.1.4 SAMPLE CUSTODY PROCEDURES

Laboratories that are in the CLP as well as non-CLP laboratories authorized to do SAS analyses will follow the sample custody procedures specified in the CLP SOW 2/88 for organic analysis and SOW 7/88 for inorganics.

14.1.5 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits are used to evaluate laboratory performance. These audits consist of random data audits, continuous trend analysis of laboratory quality control data and quarterly analysis of performance evaluation (PE) samples. Systems audits are performed to verify continuity of personnel, instrumentation and quality control requirements contained in the SOW. For CLP laboratories performing SAS analyses, systems audits are

performed by USEPA Region V Central Regional Laboratory and consist of annual on-site inspections. In addition to these audits, additional performance audits may be requested in the SAS requests for specific analyses.

For laboratories authorized to do SAS analyses only, audit procedures are as specified by the Sample Management Office.

14.1.6 DATA REDUCTION, VALIDATION AND REPORTING

Data resulting from SAS requests will be reduced, validated and reported in accordance with the specifications of the Contract Laboratory Program (Figure 14-1). Following the analyses, data evaluation, and reduction by the CLP Laboratory, the data will be sent to CDM for data validation in accordance with the procedures described in Section 14.1.5. In addition to these procedures, special procedures may be requested in the SAS requests for specific analyses. Data will be reported in accordance with the CLP SOW-2/88 for organics, SOW-7/88 for inorganics and with the SAS requests in Appendix B.

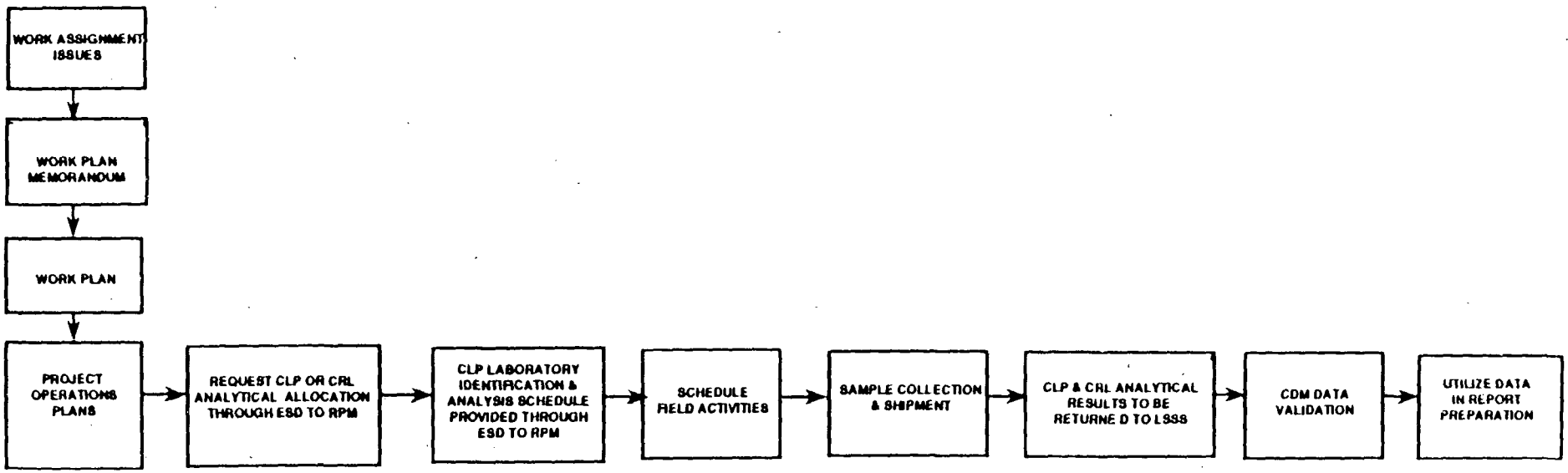
14.1.7 PROCEDURES FOR ASSESSING DATA PRECISION, ACCURACY AND COMPLETENESS

Analytical data from the SAS is assessed for contractual compliance and completeness by the Sample Management Office, based on the requirements of the SAS request. The CDM data assessment specialist reviews the data for completeness, accuracy and precision, based on the requirements outlined in the SAS request. The general procedure used for data assessment is described in Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analyses, prepared by USEPA Data Validation Work Group, February 1, 1988.

14.1.8 PREVENTIVE MAINTENANCE

All laboratories participating in the CLP are required under respective IFBs for organics and inorganics to employ Standard Operating Procedures

FIGURE 14-1 CLP ANALYTICAL DATA MANAGEMENT FLOW CHART



CRL-CENTRAL REGION LABORATORY

LSSS-LABORATORY SCIENTIFIC SUPPORT SECTION,CRL

(SOPs) for preventive maintenance for each measurement system and required support activity. All maintenance activity must be documented in logbooks to provide a history of past activities.

14.1.9 CORRECTIVE ACTION

Corrective action for SAS requests will be implemented as required by the specific SAS request, as well as by standard CLP procedures. Corrective action for the CLP is implemented at several different levels. The laboratories participating in the CLP are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification of the analyst of the error and of the correct procedures.

The Sample Management Office also may request corrective action for any contractual nonconformances identified by audit or data validation. CDM or the IEPA may request corrective action by the laboratories for any nonconformances identified in the data validation process through the Sample Management Office or, for minor problems, the lab may be contacted directly.

14.2 FIELD SCREENING SERVICES

14.2.1 ANALYTICAL PROCEDURES

The procedures for measurements taken in the field are described in the SAP. The relevant SOPs in the CDM Site Investigation Procedures Manual are as follows:

Procedure Title	SIPM Method No.
o Operation Procedure YSI Model 33 SCT Meter	5617002

Procedure Title	SIPM Method No.
o Operation Procedure for HaakeBuchler pH Stick	5617003
o Procedure for Determining Temperature of Groundwater	5617004

The SOPs are presented in Appendix A of the Southeast Rockford Operable Unit SAP.

All procedures used and results obtained will be documented in the field logbook.

14.2.2 CALIBRATION PROCEDURES AND FREQUENCY

The SOPs for field instrument calibration to be used during the Southeast Rockford Operable Unit (Appendix C) are detailed in the CDM Site Investigation Procedures Manual (SIPM). These procedures are listed below:

Procedure Title	SIPM Method No.
o Equipment and Instrument Calibration and Maintenance, Gen.	6600001
o Calibration and Maintenance Procedure YSI Model 33 SCT Meter	6617002
o Calibration and Maintenance Procedures HaakeBuchler pH Stick	6617003

The calibration for the thermometer will be performed by using an ice/water slurry to check for accuracy. The thermometer shall be within $\pm$ 1° of 0°C when the thermometer has equilibrated with the ice/water slurry.

All calibration performed in the field will be documented in the field logbook. Calibration frequency will be once daily unless the routine instrument QC check indicates that recalibration is necessary.

14.2.3 INTERNAL QUALITY CONTROL CHECKS

Quality control procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings and/or by calibrating the instruments (where appropriate). SOPs for the field instruments are listed in Subsection 14.2.2 and contained in Appendix C of this QAPP. Quality control of field sampling will involve collection of field duplicates and blanks in accordance with the applicable procedures described in the SAP and the level of effort indicated in Table 3-1 in Subsection 3.4 of this QAPP.

14.2.4 PERFORMANCE AND SYSTEMS AUDITS

Audits of field activities, including field screening, are described in Section 12.0. If the Southeast Rockford area is chosen for a performance audit, all audit procedures and results will be documented.

14.2.5 DATA REDUCTION, VALIDATION, AND REPORTING

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbook. If the data is to be used in the project reports, it will be reduced or summarized, and the method of reduction will be documented in the report.

14.2.6 PROCEDURES FOR ASSESSING DATA PRECISION, ACCURACY, AND COMPLETENESS

Data from field measurements will be assessed by thorough review of QC data (calibrations, standards, blanks, replicates), documentation that analytical procedures were adhered to, and reports from systems audits. All data will be reviewed for completeness by the principal investigator.

14.2.7 PREVENTIVE MAINTENANCE

The field equipment to be used for this project includes a field pH meter, a conductivity meter and a thermometer. Preventive maintenance of field analytical equipment used at Southeast Rockford will be conducted in accordance with the maintenance procedures outlined in the standard calibration and maintenance procedures provided in Appendix C. Specific preventive maintenance procedures for this equipment are referenced in the SAP. The Field Manager will be responsible for implementing these procedures, as well as for providing documentation of the procedures carried out both in the logbook and on the proper forms.

14.2.8 CORRECTIVE ACTION

Any nonconformance identified during field screening procedures will require implementation of corrective action and documentation of the action taken. If nonconformances are identified during data assessment, the principal investigator may request corrective action.

15.0 CORRECTIVE ACTION

Corrective action for CLP laboratory work and field work are discussed in Section 14.

If any nonconformance with established quality control procedures is identified during field operations, the Project Manager will be responsible for developing and initiating corrective action. The IEPA Project Manager will be responsible for reporting any proposed, developed or initiated corrective actions to the USEPA Region V Project Officer for review and approval. Corrective action needed for on-site activities will be initiated by the field team leader, but must be approved by the Project Manager.

The USEPA CRL is responsible for approving and initialing corrective actions for USEPA CLP Laboratories. The laboratories will be notified of the nonconformance.

16.0 QUALITY ASSURANCE REPORTS TO THE MANAGEMENT

The QA reports will be a part of the regular quarterly project reports that IEPA submits to the USEPA Region V RPMS. These reports will contain (but not be limited to) project status, results of performance and systems audits, data quality assessments, quality assurance problems with proposed corrective actions and QAPP amendments.

17.0 GLOSSARY OF TERMS

ACCURACY - The degree of agreement of a measurement (or an average of measurements of the same thing), X, with an accepted referenced or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 (X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system.

AUDIT - A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: (1) system audits that consist of a review of the quality control system to ensure that a comprehensive set of quality control methods, procedures, reviews, and signoff approvals is established or in place, and (2) performance audits in which project activities are observed in process for their compliance with the established quality control procedures and requirements.

COMPARABILITY - Expresses the confidence with which one data set can be compared to another.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

DATA VALIDATION - A systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review.

PRECISION - A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions."

QUALITY ASSURANCE - The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement effort to meet user requirements.

QUALITY ASSURANCE PROGRAM PLAN - An orderly assemblage of management policies, objectives, principles, and general procedures by which an agency or laboratory outlines how it intends to produce data of known and accepted quality.

QUALITY ASSURANCE PROJECT PLAN - An orderly assemblage of detailed and specific procedures which delineates how data of known and accepted quality are produced for a specific project. (A given agency or laboratory would have only one quality assurance program plan, but would have a quality assurance project plan for each of its projects.)

QUALITY CONTROL - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

REPRESENTATIVENESS - Expresses the confidence with which one data set can be compared to another.

STANDARD OPERATING PROCEDURE - A written document which details an operation, analysis, or action whose mechanisms are thoroughly prescribed and which is commonly accepted as the method for performing certain routine or repetitive tasks.

APPENDIX A
EXISTING DATA SUMMARY

EPA DATA

VOC ANALYSIS

Source: USEPA/TAT

Year: 1989

SOUTHEAST ROCKFORD

SUMMARY OF EXISTING DATA

PARAMETER	# DETECTED/ # SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples >/= MCL		Samples >/= 50% MCL		Samples >/= PRS	
					#	%	#	%	#	%
Trichloroethylene	97/113	.45-120	5	5	67	59.3%	76	67.3%	67	59.3%
1,1,1-Trichloroethane	97/113	.60-397	200	200	15	13.3%	35	31.0%	15	13.3%
Cis-1,2-Dichloroethylene	87/113	.58-323	70**	100	12	10.6%	29	25.7%	5	4.4%
Trans-1,2-Dichloroethylene	13/113	.57-2.5	100**	100	0	0.0%	0	0.0%	0	0.0%
1,2-Dichloroethane	37/113	.52-4.0	5	5	0	0.0%	6	5.3%	0	0.0%
1,1-Dichloroethane	85/113	.69-133	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Safe Drinking Water Act Maximum Contaminant Level (MCL)*

***Proposed MCL (May, 1989)*

****Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)*

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	DETECTION LIMIT	2917 24th St S-89	2935 24TH S-90	2911 23rd S-91	2830 23rd S-92	2817 23rd S-93	2923 22nd St S-94	2016 21nd St S-95	111 Canal S-96
Trichloroethylene	0.2	79.3	17.4	65.60	68.7	91.3	17.0	68.4	73.1
1,1,1-Trichloroethane	0.5	397	122	343	261	384	75.7	297	279
Cis-1,2-Dichloroethylene	0.5	323	93.90	273	95.2	113	42.3	96.4	98
Trans-1,2-Dichloroethylene	0.5	1.62	X	1.32	0.94	1.20	X	1.24	1.28
1,2-Dichloroethane	0.5	2.80	1.03	2.85	1.36	2.09	0.62	1.50	1.59
1,1-Dichloroethane	0.5	117	41.7	103	61.2	76.1	25.6	81.9	66.4
Analytical Number		23444	23445	23446	23447	23448	23449	23450	23451
CDM Number		1	2	3	4	5	6	7	8
Date		10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

PARAMETER	2825 21st St S-97	2901 22nd S-98	1501 Hawthorne S-99	2917 20th S-100	2921 Horton S-101	3015 20th S-102	2925 Marshall S-103	2741 Cannon S-104	2737 Hansen S-106
Trichloroethylene	73.8	56.2	X	16.3	22.9	2.17	19.1	36.8	24.8
1,1,1-Trichloroethane	306	235	X	88.4	75.5	11.3	44.4	158	109
Cis-1,2-Dichloroethylene	95.0	37.8	X	29.8	19.8	2.54	14.4	40.4	26.3
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	X	X	1.12	X
1,1-Dichloroethane	64.3	33.9	X	18.2	15.6	X	12.5	38.2	24.9
Analytical Number	23452	23453	23454	23455	23456	23457	23458	23459	23460
CDM Number	9	10	11	12	13	14	15	16	17
Date	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	1505 Halsted S-107	2730 10th S-9	2734 Lapey S-11	2814 Lapey S-12	1613 Roosevelt S-13	2718 11th S-14	2822 11th S-15	2701 18th S-16	2637 Cannon S-17
Trichloroethylene	22.1	28.0	17.4	16.3	16.3	34.8	9.9	1.37	2.19
1,1,1-Trichloroethane	100	142	21.0	65.4	66.8	167	54.5	7.55	39.6
Cis-1,2-Dichloroethylene	23.3	29.6	23.5	14	14.0	42.9	7.15	5.23	3.76
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	X	X	X	X
1,1-Dichloroethane	22.8	31.3	27.1	14.2	14.6	40.4	8.26	10.1	6.75
Analytical Number	23461	23545	23546	23547	23548	23549	23550	23551	23552
COM Number	18	19	20	21	22	23	24	25	26
Date	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

PARAMETER	2717 Bidwell S-10	1000 3rd S-19	2702 Sewell S-1	2922 Sewell S-2	2930 Hansen S-3	2745 Hansen S-4	2922 21st S-6	2512 Lindale S-7	2518 Lindberg S-8
Trichloroethylene	25.1	X	1.53	18.60	5.97	41.8	31.7	0.89	3.09
1,1,1-Trichloroethane	132	X	15.6	49.5	18.5	172	151	1.25	7.66
Cis-1,2-Dichloroethylene	27.5	X	4.74	14.1	3.09	42.6	94.60	X	1.9
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	1.86	1.96	X	X
1,1-Dichloroethane	29.8	X	14.70	11.8	2.73	49.10	40.7	X	1.16
Analytical Number	23553	23554	22837	22838	22839	22840	22841	22842	22843
COM Number	27	28	1	2	3	4	5	6	7
Date	10/24/90	10/24/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	3141 20th S-9	3112 19th S-10	2814 20th S-11	3025 18th S-12	3118 17th S-13	1725 Damen S-14	2941 Hansen S-15	2944 Horton S-16	2914 Horton S-17
Trichloroethylene	X	0.75	120	2.72	1.25	X	26.4	25.0	44.0
1,1,1-Trichloroethane	X	1.12	283	9.25	2.51	X	57.4	60.0	147
Cis-1,2-Dichloroethylene	X	X	138	3.32	X	X	19.7	19.0	40.3
Trans-1,2-Dichloroethylene	X	X	2.50	X	X	X	X	X	X
1,2-Dichloroethane	X	X	4.00	X	X	X	1.33	1.27	1.61
1,1-Dichloroethane	X	X	133.00	1.77	X	X	22.0	21.3	40.0
Analytical Number	22844	22845	22846	22847	22848	22849	22850	22851	22852
COM Number	8	9	10	11	12	13	14	15	16
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	2817 Horton S-19	2806 Horton S-20	2806 Horton S-21	2725 Horton S-22	21316 Alton S-23	3133 Marshall S-24	3111 Marshall S-25	3030 Marshall S-26	3006 Marshall S-27
Trichloroethylene	67.8	52.4	40.0	11.4	2.29	1.79	1.41	5.88	10.6
1,1,1-Trichloroethane	305	255	197	45.4	21.0	3.15	2.64	3.06	13.5
Cis-1,2-Dichloroethylene	65.5	66.1	50.6	39.6	7.06	X	X	3.80	7.55
Trans-1,2-Dichloroethylene	0.68	0.82	0.76	X	X	X	X	X	X
1,2-Dichloroethane	2.39	2.86	2.76	1.42	X	X	X	2.01	1.26
1,1-Dichloroethane	58.8	55.3	42.4	57.8	6.90	X	X	9.11	12.5
Analytical Number	22853	22854	22855	28856	22857	22858	22859	22860	22861
COM Number	17	18	19	20	21	22	23	24	25
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	2941 Marshall S-28	2905 Marshall S-29	2837 Marshall S-30	2801 Marshall S-31	2738 Marshall S-32	2717 Marshall S-33	2706 Marshall S-34	3140 Sewell S-35	3141 Sewell S-36
Trichloroethylene	10.5	38.3	39.4	62.4	65.6	1.10	11.3	X	X
1,1,1-Trichloroethane	30.3	113	156.0	310	329	16.0	54.8	X	X
Cis-1,2-Dichloroethylene	6.84	31.5	40.2	74.7	93.0	5.61	26.8	X	X
Trans-1,2-Dichloroethylene	X	X	X	0.79	1.14	X	X	X	X
1,2-Dichloroethane	X	0.93	1.40	2.01	2.53	X	0.95	X	X
1,1-Dichloroethane	4.96	26.0	40.8	61.2	75.3	17.9	39.9	X	X
Analytical Number	22862	22863	22864	28865	22866	22867	22868	22869	22870
CDM Number	26	27	28	29	30	31	32	33	34
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	3151 Sewell S-37	3002 Sewell S-38	3002 Sewell S-39	2841 Sewell S-40	2813 Sewell S-42	2742 Sewell S-43	2722 Sewell S-44	3318 Potter S-45	3318 Potter S-46
Trichloroethylene	X	2.58	9.51	24.2	38.8	0.53	2.85	X	X
1,1,1-Trichloroethane	X	9.02	26.4	106	227	5.76	27.5	X	X
Cis-1,2-Dichloroethylene	X	2.12	5.87	35.30	41.4	0.58	11.5	X	X
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	1.12	1.73	X	X	X	X
1,1-Dichloroethane	X	1.43	4.06	36.7	44.0	0.78	29.9	X	X
Analytical Number	22871	22872	22873	22874	22875	22876	22877	22878	22879
CDM Number	35	36	37	38	39	40	41	42	43
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	1625 Johnson S-48	2929 Powell S-49	2829 Powell S-50	2837 Cannon S-51	2822 Cannon S-52	2866 Cannon S-53	2934 Cannon S-55	3008 Cannon S-56	3000 Hansen S-57
Trichloroethylene	X	13.6	30.4	37.0	24.6	24.9	9.42	3.25	2.78
1,1,1-Trichloroethane	X	39.3	165	88.3	140	143	33.5	13.2	11.2
Cis-1,2-Dichloroethylene	X	7.59	31.7	24.1	42.0	40.2	5.37	3.08	2.54
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	1.2	0.52	0.75	0.76	X	X	X
1,1-Dichloroethane	X	5.77	33.9	23.8	47.9	48.2	4.22	2.19	1.75
Analytical Number	22880	22881	22882	22883	22884	22885	22886	22887	22888
COM Number	44	45	46	47	48	49	50	51	52
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	2913 Hansen S-59	2846 Hansen S-59	2833 Hansen S-60	2804 Hansen S-61	2948 Kinsey S-62	2917 Kinsey S-63	2901 Kinsey S-64	2833 Kinsey S-65	2815 Kinsey S-66
Trichloroethylene	10.6	28.3	23.9	19.1	2.67	1.90	5.56	17.8	33.7
1,1,1-Trichloroethane	28.3	75.0	52.8	201	5.35	7.31	18.1	62.9	133
Cis-1,2-Dichloroethylene	5.34	20.8	17.6	47.5	1.86	0.86	2.63	11.9	27.7
Trans-1,2-Dichloroethylene	X	X	X	0.57	X	X	X	X	X
1,2-Dichloroethane	X	X	X	0.99	X	X	X	X	0.57
1,1-Dichloroethane	4.38	18.8	17.8	43.8	1.50	0.90	2.62	10.9	33.8
Analytical Number	22889	22890	22891	22892	22893	22894	22895	22896	22897
COM Number	53	54	55	56	57	58	59	60	61
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	2742 Kinsey S-67	2826 11th S-68	3141 10th S-69	3141 40th S-70	2614 Kinsey S-71	2902 11th S-72	2845 Lapey S-74	2929 11st S-75	2911 Lapey S-76
Trichloroethylene	33.4	27.2	1.99	1.99	1.18	10.5	13.3	3.40	3.62
1,1,1-Trichloroethane	156	68.40	4.27	5.21	16.7	35.2	47.3	13.2	14.2
Cis-1,2-Dichloroethylene	39.7	21.3	X	X	3.42	5.21	7.35	2.40	2.11
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	1.5	X	X	X	X	X	X	X	X
1,1-Dichloroethane	38.0	22.0	X	X	9.90	4.83	7.01	2.02	1.93
Analytical Number	22898	22899	22900	22901	22902	22903	22904	22905	22906
COM Number	62	63	64	65	66	67	68	69	70
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	3002 Lapey S-78	3031 Lapey S-79	3228 9th S-81	3329 9th S-82	3305 Lapey S-83	2106 Sandy S-84 Hollow	2746 Lapey S-86	220 Brooke S-20	3113 Carlson S-21
Trichloroethylene	2.29	1.42	0.56	X	X	X	29.9	X	21.90
1,1,1-Trichloroethane	7.35	4.80	2.01	0.60	X	X	158	X	0.62
Cis-1,2-Dichloroethylene	0.62	X	X	X	X	X	29.2	X	1.92
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	x
1,2-Dichloroethane	X	X	X	X	X	X	0.77	X	x
1,1-Dichloroethane	0.69	X	X	X	X	X	32.2	X	x
Analytical Number	22908	22909	22910	22911	22012	22913	22914	24967.0	24968
COM Number	71	72	73	74	75	76	77	1	2
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	12/8/90	12/8/90

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	3007 Carlson	823 Ranger	606 New Milford	2522 25th	2484 Mariposa	5002 Sherwood
	S-22	S-24	S-25	S-26	S-28	S-29
Trichloroethylene	1.37	17.5	21.7	0.45	x	x
1,1,1-Trichloroethane	x	41.3	37.2	23.8	x	x
Cis-1,2-Dichloroethylene	1.90	12.9	0.74	x	x	x
Trans-1,2-Dichloroethylene	x	x	x	x	x	x
1,2-Dichloroethane	x	1.87	x	x	x	x
1,1-Dichloroethane	x	16.3	0.87	2.91	x	x
Analytical Number	24969	24970	24972	24873	24974	24975
CDM Number	3	4	5	6	7	8
Date	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90

EPA DATA

FULL VOC ANALYSIS

Source: USEPA/TAT
Year: 1989

SOUTHEAST ROCKFORD DATA SUMMARY

GC-MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples >/= MCL		Samples >/= 50% MCL		Samples >/= PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorbromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichlorethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1-Dichloroethylene	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-894								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methylene Chloride	2\2 (b)	15.5-19.5								
1,1,2,2,-Teterachloroethane	1\14	1.9								
Tetrachloroethylene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Toluene			2000**	2000						
1,1,1-Trichloroethane	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
1,1,2 Trichloroethane	3\14	1.1-2.8								
Trichloroethylene	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
Trichlorofluoromethane	1\14	3								
Vinyl Chloride			2	2						
m & p-Xylene (as m-Xylene)				10000						
0-Xylene										

** Safe Drinking Water Act Maximum Contaminant Level (MCL)*
***Proposed MCL (May, 1989)*
****Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)*
a=Results for this chemical for two of the fourteen samples are not legible. These are not included in the tablulation of the following columns.
b=Only two samples were tested for the presence of Methylene Chloride.

EPA TAT

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

PARAMETER	UNITS	2706 Lapey S-10	2827 24th S-88	2729 Cannon S-105	2826 22nd S-5	2833Horton S-18	2806 Sewell S-41	1724 Hamilton S-47	2904 Cannon S-54
Bromoform	µg/l	X	X	X	1.1 J	X	X	X	X
Chloromethane	µg/l	X	2.85	X	X	X	X	X	X
Chloroform	µg/l	4.1 J	5.50	3.4 J	8.30	3.7 J	3.9 J	X	X
1,1-Dichloroethane	µg/l	56.50	85.30	71.20	109.00	47.00	47.30	X	12.40
1,2-Dichloroethane	µg/l	1.9 J	2.2 J	1.5 J	4.0 J	1.3 J	1.6 J	X	X
1,1-Dichloroethylene	µg/l	31.00	42.70	29.50	43.20	28.60	26.00	X	7.70
1,2 Dichloroethylene	µg/l	33.60	96.30	37.80	158.00	20.10	22.40	X	5.70
Dichloromethane	µg/l	X	X	X	2.1 J	X	X	X	X
Methylene Chloride	µg/l								
1,1,2,2,-Tetrachloroethane	µg/l	X	X	X	1.9 J	X	X	X	X
Tetrachloroethylene	µg/l	X	6.60	X	6.70	2.6 J	2.3 J	X	X
1,1,1-Trichloroethane	µg/l	143.00	245.00	168.00	227.00	142.00	222.00	2.1 J	35.60
1,1,2 Trichloroethane	µg/l	1.1 J	1.6 J	X	2.8 J	X	X	X	X
Trichloroethylene	µg/l	58.90	104.00	44.00	67.10	59.40	40.50	X	15.50
Trichlorofluoroethane	µg/l	X	X	X	3.0 J	X	X	X	X
Analytical No.:		23544	23442	23443	22829	22830	22831	22832	22833
		1	2	3	1	2	3	4	5
		10/24/89	10/24/89	10/24/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89

PARAMETER	UNITS	1621 Alton S-73	3021 9th S-80	2825 Lapey S-85	Unknown S-27	2733 Kinsey S-11	2741 Cannon S-10
Bromoform	µg/l	X	X	X	X	X	X
Chloromethane	µg/l	X	X	X	X	X	X
Chloroform	µg/l	3.8 J	X	X	X	NL	NL
1,1-Dichloroethane	µg/l	57.00	X	1.9 J	X	213	320
1,2-Dichloroethane	µg/l	1.8 J	X	X	X	X	X
1,1-Dichloroethylene	µg/l	27.60	X	8.60	X	27.5	47.8
1,2 Dichloroethylene	µg/l	22.50	X	X	X	556	894
Dichloromethane	µg/l	X	1.8 J	X	X	X	X
Methylene Chloride	µg/l					15.5	19.5
1,1,2,2,-Tetrachloroethane	µg/l	X	X	X	X	X	X
Tetrachloroethylene	µg/l	X	X	X	X	0.77	1.32 J
1,1,1-Trichloroethane	µg/l	162.00	3.0 J	136.00	X	NL	NL
1,1,2 Trichloroethane	µg/l	X	X	X	X	X	X
Trichloroethylene	µg/l	32.70	X	18.10	X	31.8	35.4
Trichlorofluoroethane	µg/l	X	X	X	X		
Analytical No.:		22834	22835	22836	24966	>9V568	>9V567
		6	7	8	1	1	2
		10/3-5/89	10/3-5/89	10/3-5/89	12/8/89	8/10/89	8/10/89

J=Estimated Value
NL=Not Legible
X=Analyzed but not detected

IDPH 1989
DATASET #1

Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (Pre-December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	17\187										
Trichlorofluromethane	2\187	2	19								
1,1-Dichloroethene	109\187	ND	63	7	7	43	23.0%	51	27.3%	43	23.0%
1,1-Dichloroethane	115\187	2	81								
Trans-1,2-Dichloroethene	12\187	1	12								
Chloroform	24\187	1	14								
1,2-Dichloroethane	25\187	ND	16	5	5	13	7.0%	17	9.1%	13	7.0%
1,1,1-Trichloroethane	164\187	1	436	200		28	15.0%	54	28.9%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	165\187	1	122	5	5	109	58.3%	119	63.6%	109	58.3%
Benzene	1\187	7	7	5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane	16\187	2	74								
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100/5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	8\187	7	108								
Vinyl Chloride				2	2						
Tetrachloroethylene	113\187	ND	15	5**	5	9	4.8%	22	11.8%	9	4.8%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	9/12/89	11/28/89	12/5/89	11/6/89	8/21/89	11/6/89	10/25/89	10/25/89	10/25/89
Parameter	11th (#2) 2706	16th 3146	17th 3012	17th 3110	17th 3120	17th 3141	18th 2601	18th 2603	18th 2604
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace	Trace					
Trichlorofluoromethane									
1,1-Dichloroethene	50.40		2.358		0.3		1.8		
1,1-Dichloroethane	40.60		Trace				1.8	3.2	
Trans-1,2-Dichloroethene	11.60		Trace						
Chloroform	9.60		0.542						
1,2-Dichloroethane									
1,1,1-Trichloroethane	352.60		21.762	1.871	2.7		29.4	38.9	<1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	65.70		5.001	1.014	1.5		1	1.3	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	1.60		Trace	Trace			<1	<1	

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/25/89	11/7/89	11/6/89	11/28/89	8/21/89	9/19/89	11/28/89	11/28/89	11/28/89
Parameter	18th 2606	18th 3007	18th 3035	18th 3117	18th 3146	19th 2908	19th 3019	19th 3101	19th 3114
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace						
Trichlorofluoromethane									
1,1-Dichloroethene		4.7	Trace			1.3			
1,1-Dichloroethane	1.8	11	Trace			13.7			
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		49.4	8.783	1.3		192.4	4.5		
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	<1	17.8	2.652	0.7		45.3	2.0		
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		4.5	Trace				0.6		

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/6/89	11/28/89	11/28/89	8/21/89	9/26/89	9/26/89	9/26/89	9/26/89	9/26/89
Parameter	19th 3117	19th 3120	19th 3121	19th 3129	20th 2814	20th 2822	20th 2913	20th 2923	20th 2930
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene					<1	4.0	2.19	<1	1.4
1,1-Dichloroethane					46.8	19.5	19.2	3.1	8.0
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	2.537				57.5	436	204.8	83.1	164.8
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.417	0.5			121.7	112.5	44.0	8.2	21.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				15.1	1.9	6.49	3.8	1.51

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 20th 3024	11/6/89 20th 3025	11/28/89 20th 3025	8/21/89 20th 3141	11/28/89 20th 3331	9/26/89 21st 2923	9/26/59 21st 2944	9/26/89 23rd 2912	9/26/89 23rd 2927
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene						1.3	<1	3.1	<1
1,1-Dichloroethane		2.4	2.8			2.3	6.7	34.4	5.5
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane		0.4							
1,1,1-Trichloroethane	0.6	18.0	15.4			89.3	95.3	436	68.1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.9	4.1	4.3			31.4	19.9	97.1	9.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		2.1	1.8			6.8	5.8	4.3	

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 23rd 2929	9/26/89 23rd 2931	11/7/89 23rd 3115	9/19/89 8th 2922	12/5/89 8th 2929	9/19/89 8th 2940	9/19/89 9th 2726	10/25/89 9th 2905	11/7/89 9th 3110
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride					Trace				
Trichlorofluoromethane									
1,1-Dichloroethene	4.7	<1					1.3	0.6	
1,1-Dichloroethane	14.8	6.0			Trace		24.2		
Trans-1,2-Dichloroethene									
Chloroform	.								
1,2-Dichloroethane									
1,1,1-Trichloroethane	32.4	82.2		9.3	2.880	8.5	217	7.9	3.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	4.7	7.0		1.0	2.601	2.0	44.2	3.2	1.7
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane				47.9		1.8	11.2		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			Trace		Trace			<1	

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/7/89	12/5/89	12/5/89	10/17/89	10/25/89	1/10/83	10/79/89	9/12/89	9/12/89
Parameter	9th 3121	9th 3214	9th 3242	Alpine N. 7004	Alton 2118	Bildahl 3242	Cannon 2801	Cannon 2802	Cannon 2810
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride		Trace	Trace						
Trichlorofluoromethane									
1,1-Dichloroethene					0.7		11.4	51.1	41.8
1,1-Dichloroethane		Trace			6.4		28.5	39.2	36.9
Trans-1,2-Dichloroethene									
Chloroform								11.2	9.5
1,2-Dichloroethane								9.0	7.2
1,1,1-Trichloroethane	3	2.550	1.755		20.4	2.5	97.5	200.0	283.2
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	2	1.663	0.586		2.7	2.0	30.5	52.7	60.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.4	Trace	Trace		1.3	<1	1.1	6.6	5.3

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/12/89 Cannon 2817	8/21/89 Cannon 2828	10/17/89 Cannon 2837	10/17/89 Cannon 2915	11/7/89 Cannon 2918	11/28/89 Cannon 3004	8/20/89 Hanson 2804	9/19/89 Hanson 2834	9/19/89 Hanson 2842
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	24.7	25.0	9.4	3.4			52.5	0.7	2.9
1,1-Dichloroethane	24.0	34.0	16.3	5.8	4.8	1.5		10.2	10.9
Trans-1,2-Dichloroethene									
Chloroform	7.0	5.7							
1,2-Dichloroethane		1.8					0.9		
1,1,1-Trichloroethane	83.5	177.0	89.1	49.4	38.8	14.7	204	105.8	101
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	20.7	31.0	47.1	14.3	16.2	6.3	73.4	29.6	32.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane								3.3	2.4
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene		23.0							
Vinyl Chloride									
Tetrachloroethylene	0.8	1.2	0.7	0.5			3.3		

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/10/89 Hanson 2908	10/17/89 Hanson 2911	10/17/89 Hanson 2946	9/12/89 Hanson 2633	10/17/89 Hanson 2714	9/12/89 Hanson 2802	9/12/89 Hanson 2821	9/26/89 Hanson 2901	9/26/89 Hanson 2902
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		2.7	6.1	14.0	17.2	48.0	32.3	<1	1.0
1,1-Dichloroethane		4.7	14.4		65.4	39.6	28.2	5.4	9.0
Trans-1,2-Dichloroethene	1.0								
Chloroform									
1,2-Dichloroethane						8.4			
1,1,1-Trichloroethane	31.0	32.1	13.4	13.9	141	287.5	200.0	49.3	97.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethane	23.0	13.3	14.8	2.7	28.3	68.5	40.0	20.3	27.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		0.4	0.2	0.9	0.3	3.3	1.6	<1	1.0

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/17/89	11/6/89	10/17/89	9/12/89	9/19/89	9/12/89	9/12/89	9/12/89	9/19/89
Parameter	Hanson 2907	Hanson 2938	Horton 2717	Horton 2726	Horton 2738	Horton 2741	Horton 2742	Horton 2746	Horton 2805
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluromethane									
1,1-Dichloroethene	3.7		3.6	24.8	2.4	60.2	63.4	62.6	1.5
1,1-Dichloroethane	5.8	1.8	28.3	22.8	36.5	48.1	50.5	50.6	23.9
Trans-1,2-Dichloroethene									
Chloroform				7.1		13.5	14.0	14.0	
1,2-Dichloroethane				5.6		11.6	13.2	13.6	
1,1,1-Trichloroethane	49.7	16.7	16.0	78.6	411.6	100.0	434.3	400.0	218.4
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	14.3	6.2	1.7	2.7	92.8	68.1	75.8	64.3	43.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					53.9				2.1
Tolulene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene							108.4		
Vinyl Chloride									
Tetrachloroethylene	0.4		0.5			8.6	4.3	2.6	

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Horton 2811	9/12/89 Horton 2818	9/19/89 Horton 2834	9/19/89 Horton 2835	9/19/89 Horton 2838	10/17/89 Horton 2905	10/17/89 Horton 2942	11/28/89 Horton 3001	11/7/89 Horton 3133
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	26.2	29.5	2.8	1.0	1.3	9.4	4.2		
1,1-Dichloroethane	62.3	35.6	27.5	13.3	22.2	44.8	7.5	4.4	
Trans-1,2-Dichloroethene									
Chloroform		1.2							
1,2-Dichloroethane		7.4							
1,1,1-Trichloroethane	249.0	205.1	228.0	197.3	218.8	133.0	13.7	30.1	2.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	47.6	57.6	54.1	26.9	51.9	51.6	12.6	8.7	1.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane			56.1	36.7					
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	3.8	3.2				1.2	0.4	1.8	

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/28/89	10/25/89	8/20/89	9/12/89	10/17/89	9/19/89	9/19/89	10/25/89	10/17/89
Parameter	Horton 3037	Horton 2924	Kinsey 2728	Kinsey 2803	Kinsey 2806	Kinsey 2813	Kinsey 2822	Kinsey 2826	Kinsey 2829
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane		1.8						18.9	
1,1-Dichloroethene		3.2	53.9	34.3	23.5	0.9	0.8	51.9	8.3
1,1-Dichloroethane				30.9	50.2	15.1	13.8		14.7
Trans-1,2-Dichloroethene									
Chloroform				8.4					
1,2-Dichloroethane			1.0	5.2					
1,1,1-Trichloroethane	1.1	26.5	161.0	219.0	197.0	193.2	182.6	193.8	94.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.9	8.5	63.8	24.1	50.8	20.4	28.2	58.9	15.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane						20.0	4.2		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		<1	1.8	1.5	1.3			3.5	0.2

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	1/10/89	9/19/89	8/20/89	10/17/89	11/7/89	9/26/89	9/12/89	9/19/89	9/26/89
Parameter	Kinsey 2829	Kinsey 2833	Kinsey 2909	Kinsey 2920	Kinsey 3002	Lapey 2746	Lapey 2817	Lapey 2838	Lapey 2918
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluromethane									
1,1-Dichloroethene		0.8	3.5	2.3	0.9	2.7	23.6	0.5	
1,1-Dichloroethane		12.6		3.9		25.2	17.5	6.5	
Trans-1,2-Dichloroethene	3.0								
Chloroform							6.4		
1,2-Dichloroethane			0.2				2.9		
1,1,1-Trichloroethane	37.0	81.0	13.9	29.1	10.6	224.2	114.2	50.6	1.5
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	35.0	20.9	7.0	7.5	2.8	50.0	21.0	17.5	<1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Tolulene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			0.2	0.2		4.1			

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	1/7/89	11/7/89	11/7/89	11/7/89	11/7/89	11/28/89	11/6/89	11/28/89	1/28/89
Parameter	Lapey 3116	Lapey 3117	Lapey 3121	Lapey 3125	Lapey 3130	Lindberg 2402	Lindberg 2407	Lindberg 2501	Lindberg 2506
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane							Trace		
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	3.0	2.7	2.7	3.8	4.5		0.634	0.8	6.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.3	1.8	1.9	2.1	2	0.6	1.609	1.4	2.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene							Trace		0.8

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	12/5/89	11/6/89	11/6/89	6/20/89	6/20/89	11/6/89	10/17/89	11/7/89	9/12/89
Parameter	Lindberg 2512	Lindberg 2515	Lindberg 2518	Lindale 2412	Lindale 2424	Lindale 2612	Marshall 2845	Marshall 2641	Marshall 2722
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride	Trace		Trace						
Trichlorofluoromethane									
1,1-Dichloroethene	0.786	0.595	1.184				11.9		13.3
1,1-Dichloroethane	Trace						26.9	13.4	12.4
Trans-1,2-Dichloroethene	Trace								
Chloroform									3.9
1,2-Dichloroethane									
1,1,1-Trichloroethane	5.464	3.684	11.159	1.5	2.2	1.686	93.6	157	54.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethane	2.856	2.223	4.232	0.7	1.3	1.269	47.9	7.7	4.1
Benzene				6.5					
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace	Trace	Trace	0.3	1.0	Trace	0.9	1.4	<1

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/28/89	11/28/89	10/17/89	8/21/89	9/19/89	9/19/89	8/21/89	9/19/89	2/7/89
Parameter	Marshall 2734	Marshall 273	Marshall 2745	Marshall 2813	Marshall 2825	Marshall 2830	Marshall 2838	Marshall 2909	Marshall 2926
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	19.2		30.0	38.0	1.6	1.1	36.0	1.2	
1,1-Dichloroethane	80.9		67.6	34.0	30.0	18.7	39.0	8.8	
Trans-1,2-Dichloroethene							1.1		2.0
Chloroform				7.0			7.0		
1,2-Dichloroethane				3.1			2.9		
1,1,1-Trichloroethane	170.5	1.8	295.0	154	246	208.4	187.0	98.1	24.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	37.5		82.9	35.0	58.2	40.1	44.0	32.6	57.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					74.0	3.2		23.1	
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene	50.6			26.0			27.0		
Vinyl Chloride									
Tetrachloroethylene		0.5	3.9	1.7					

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Marshall 2937	10/17/89 Marshall 2946	10/25/89 Marshall 3018	10/25/89 Marshall 3034	2/7/89 Marshall 3101	9/12/89 Potter 2700	9/19/89 Potter 2825	10/25/89 Potter 2826	8/21/89 Potter 2837
Chloromethane									
Bromoethane									
Chloroethene									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	2.3	1.1	1.4	0.09		32.2	0.9	9.1	20.0
1,1-Dichloroethane	6.5	1.8	3.1	3.7		25.2	15.8	10.2	25.0
Trans-1,2-Dichloroethene						6.7			
Chloroform						6.9			4.6
1,2-Dichloroethane									1.4
1,1,1-Trichloroethane	7.0	13.8	13.1	0.5	<1	111.8	192.5	93.1	113.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	5.2	5.0	4.0	2.3	2.0	23.4	40.8	27.5	24.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane							28.0		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									18.0
Vinyl Chloride									
Tetrachloroethylene		0.2	1.6			2.2		<1	1.2

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 Potter 2933	10/25/89 Sewell 2718	9/12/89 Sewell 2814	9/12/89 Sewell 2822	9/19/89 Sewell 2828	6/20/89 Sewell 2902	9/26/89 Sewell 2909	2/7/89 Sewell 2909	9/26/89 Sewell 2917
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		3.2	51.0	49.0	1.1	10.9			<1
1,1-Dichloroethane	2.9	27.2	55.6	54.2	18.8		6.7		4.9
Trans-1,2-Dichloroethene				2.2				2.0	
Chloroform	0.6		11.5	11.7					
1,2-Dichloroethane	0.3	15.6	9.1	9.2					
1,1,1-Trichloroethane	29.8		90.0	210.0	215.0	38.9	88.9	36.0	38.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	12.0	1.8	73.7	73.2	47.9	21.8	25.1	22.0	28.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					32.3				
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.6	0.6	5.0	6.7		0.3	1.1	1.0	

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/26/89 Sewell 2921	9/26/89 Sewell 2930	8/21/89 Sewell 2930	12/25/89 Sewell 2934	9/26/89 Sewell 2938	9/26/89 Sewell 2938	9/26/89 Sewell 2976	10/25/89 Sewell 3016	10/25/89 Sewell 3026
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	<1	<1	5.9	3.2	<1	<1			4.4
1,1-Dichloroethane	4.4	4.6	7.3	7.3	6.8	6.8	9.9		19.0
Trans-1,2-Dichloroethene			1.1						
Chloroform			2.0						
1,2-Dichloroethane			0.7						
1,1,1-Trichloroethane	107.3	111.2	28.0	48.0	82.9	82.9	102.5	<1	7.7
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	19.5	19.8	13.0	17.8	18.5	18.5	30.6		9.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene			6.9						
Vinyl Chloride									
Tetrachloroethylene	1.0	1.4	1.0	1.5	<1	<1	1.6		<1

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/25/89	11/7/89	11/7/89	11/7/89	9/12/89	10/25/89	11/7/89	9/12/89	8/21/89
Parameter	Sewell 3040	Sewell 3136	Sewell 3138	Sewell 3142	Wills 1201	Wills 1610	Wills 1703	Wills 1920	WILLS 1935
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluromethane									
1,1-Dichloroethene	0.9					12.8	42.8	49.2	30.0
1,1-Dichloroethane	1.5					33.6	37	39.7	55.0
Trans-1,2-Dichloroethene									1.1
Chloroform								11.8	11.0
1,2-Dichloroethane								9.8	3.4
1,1,1-Trichloroethane	8.6	3.9	3.4	3.0	1.50	133	220	260	210
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	3.4	2.3	2.1	1.8	<1	37.5	73.9	50.0	45.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									42.0
Vinyl Chloride									
Tetrachloroethylene	0.9		<1		<1	0.9	1.7	4.3	2.1

IDPH 1989 (Dataset #1)

Parameter	12/5/89 Brooke 1004	11/6/89 Brooke 1113	12/5/89 Collins 3310	11/6/89 Hamilton 1709	11/6/89 Hamilton 1717	12/6/89 Johnson 1613	12/5/89 Johnson 1638	12/5/89 Johnson 1746	12/5/89 Lyran 1738
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride	Trace		Trace		Trace		Trace	Trace	
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane	Trace		Trace						
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	1.905	2.6	2.173	1.616	1.782				
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.545	0.8	0.868	0.55	1.042				
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace		Trace	Trace	Trace		Trace	Trace	

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/6/89 Pershing 1637	12/5/89 Sandy Hllw 1734	12/5/89 Sandy Hllw 1810	12/5/89 Sandy Hllw 1812	12/5/89 Sandy Hllw 2701	10/25/89 Reed 1825	10/25/89 Reed 1930
Chloromethane							
Bromoethane							
Chloroethane							
Methylene Chloride		Trace	Trace	Trace	Trace		
Trichlorofluoromethane							
1,1-Dichloroethene						8 5	12 8
1,1-Dichloroethane		Trace				14 4	46 3
Trans-1,2-Dichloroethene							
Chloroform							
1,2-Dichloroethane							
1,1,1-Trichloroethane	4.057					92.1	93
Carbon Tetrachloride							
Bromodichloromethane							
1,2-Dichloropropane							
Trans-1,3-Dichloropropene							
Trichloroethene	2.107					35	46 6
Benzene							
Dibromochloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorbenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethenyl Benzene							
O-Xylene (1,2-Dimethylbenzene)							
m & p Xylene (as m Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethylene							
Vinyl Chloride							
Tetrachloroethylene				Trace	Trace	0.5	1 5

IDPH DECEMBER 1989
DATASET #2

Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l) Minimum	RANGES (ug/l) Maximum	MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL #	SAMPLES >/= MCL %	SAMPLES >/= 50% MCL #	SAMPLES >/= 50% MCL %	SAMPLES >/= PRS #	SAMPLES >/= PRS %
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	3\80										
Trichlorofluromethane											
1,1-Dichloroethene	15\80	1	30	7	7	3	3.8%	6	7.5%	3	3.8%
1,1-Dichloroethane	21\80	1	78								
Trans-1,2-Dichloroethene	10\80										
Chloroform	8\80	1	5								
1,2-Dichloroethane	12\80	1	23	5	5	1	1.3%	3	3.8%	1	1.3%
1,1,1-Trichloroethane	40\80	ND	159	200		0	0.0%	3	3.8%		
Carbon Tetrachloride	2\80	2	27	5	5	1	1.3%	1	1.3%	1	1.3%
Bromodichloromethane	1\80	2	2								
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	42\80	ND	58	5	5	9	11.3%	12	15.0%	9	11.3%
Benzene	1\80	7	7	5	5	1	1.3%	1	1.3%	1	1.3%
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene	1\80			700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	3\80	3	65								
Vinyl Chloride				2	2						
Tetrachloroethylene	39\80	ND	7	5**	5	1	1.3%	3	3.8%	1	1.3%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Bildahl 3029	12/4/89 Bildahl 3221	12/4/89 Bildahl 3237	12/12/89 Bildahl 3318	12/12/89 Bildahl 3324	12/12/89 Carlson 3006	12/4/89 Collins 3201	12/4/89 Collins 3202	12/4/89 Collins 3230
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane			0.5						
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		1.3	1.0				4.7	3.7	1.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.3	1.3	0.8			0.9	2.8	1.1	0.4
Benzene	7.1								
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene						Trace	4.8	6.5	1.5

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Collins 3234	12/12/89 Collins 3317	12/11/89 Ed Vera 3414	12/11/89 Ed Vera 3425	12/11/89 Fruitland 3090	12/12/89 Harrison 2313	12/4/89 Johnson 1631	12/11/89 Johnson 1637	12/11/89 Johnson 1641
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluromethane									
1,1-Dichloroethene						0.7			
1,1-Dichloroethane									
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		2.7				12.3			
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.6	1.1							
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluiene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.8	Trace				Trace			

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Johnson 1842	12/11/89 Johnson 1711	12/11/89 Johnson 1728	12/12/89 Kishakaukee 371	12/12/89 Lapey 3038	12/12/89 Lapey 3205	12/12/89 Lapey 3230	12/4/89 Lapey 3245	12/11/89 Lund 2426
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane				Trace	Trace				
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane				0.6	2.980	2.731		0.7	
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene				0.9	1.673	1.6			
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene				Trace	Trace	Trace			

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Lund 2517	12/11/89 Lund 2526	12/11/89 Lyran 1645	12/11/89 Lyran 1650	12/11/89 Lyran 1714	12/14/89 Main 2921	12/4/89 Marshall 2721	12/4/89 Marshall 2730	12/14/89 Marshall 2813
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene							4.6	28.6	
1,1-Dichloroethane							31.6	77.9	
Trans-1,2-Dichloroethene									
Chloroform								4.7	
1,2-Dichloroethane									
1,1,1-Trichloroethane							18.1	108.0	
Carbon Tetrachloride									
Bromodichloromethane							1.5		
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene							1.8	23.7	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene							13.5	64.5	
Vinyl Chloride									
Tetrachloroethylene						Trace			Trace

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 Marshall 3138	12/14/89 Pershing 1802	12/11/89 Sandy Hllw 1715	12/14/89 Sandy Hllw 1816	12/12/89 Sandy Hllw 2413	12/14/89 Sandy Hllw 3211	12/11/89 Southworth3433	12/4/89 7th 3133	12/4/89 7th 3209
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		1.285							
1,1-Dichloroethane		Trace							
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane		1.158							
1,1,1-Trichloroethane	2.6					1.890		1.7	2.9
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.7	2.376				0.954		0.6	0.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene		Trace							
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				Trace			0.2	3.3

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 7th 3217	12/4/89 7th 3241	12/8/89 7th 3317	12/8/89 8TH 2810	12/12/89 8th 3330	12/8/89 9th 3018	12/14/89 9th 3125	12/4/89 9th 3137	12/12/89 9th 3238
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene				2.822					
1,1-Dichloroethane				Trace					
Trans-1,2-Dichloroethene				Trace					
Chloroform				0.711					
1,2-Dichloroethane				22.525	1.311	0.607	2.388	3.9	1.7
1,1,1-Trichloroethane	1.2	0.4	1.978						
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.2		0.907	5.644			1.532	1.4	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Melnyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.9	0.7	Trace	Trace		Trace	Trace	1.0	Trace

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 9th 3321	12/12/89 9th 3326	12/4/89 10th 3125	12/4/89 10th 3142	12/5/89 10th 3201	12/12/89 10th 3209	12/12/89 10th 3210	12/12/89 10th 3236	12/5/89 10th 3245
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride					Trace		Trace		Trace
Trichlorofluoromethane									
1,1-Dichloroethene					Trace		Trace		
1,1-Dichloroethane					Trace		Trace	Trace	
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane			2.8	2.8	3.374		2.567	1.693	1.597
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene				2.1	2.055		1.457	0.894	0.618
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		Trace		1.5	Trace		Trace	Trace	Trace

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 2707	12/12/89 11th 2734	12/12/89 11th 2744	12/12/89 11th 2834	12/12/89 11th 2837	12/12/89 11th 2842	12/12/89 11th 2901	12/12/89 11th 2926	12/12/89 11th 2942
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethene									
1,1-Dichloroethene	2.490	29.998	30.03		4.767	3.584	Trace	1.027	0.956
1,1-Dichloroethane	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Trans-1,2-Dichloroethene	Trace	Trace	Trace		Trace	Trace		Trace	Trace
Chloroform		3.833	3.736	1.175	1.067	0.746	0.621		
1,2-Dichloroethane	0.504	1.612	1.646	0.522			Trace		
1,1,1-Trichloroethane	5.885	152.800	158.8	41.7	37.0	29.8	23.85	10.544	9.675
Carbon Tetrachloride	1.914	27.249							
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.614	55.400	57.7	18.584	17.182	14.810	9.293	4.397	3.582
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluiene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 3132	12/11/89 18th 3414	12/11/89 18th 3110	12/11/89 18th 3510	12/4/89 Brooke 1317	12/4/89 Kinsey 2929	12/4/89 Sewell 3133	12/4/89 20th 3110
Chloromethane								
Bromoethane								
Chloroethane								
Methylene Chloride								
Trichlorofluromethane								
1,1-Dichloroethene								
1,1-Dichloroethane	Trace					2.1		
Trans-1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
1,1,1-Trichloroethane	3.186		2.2		3.2	11.4		2.3
Carbon Tetrachloride								
Bromodichloromethane								
1,2-Dichloropropane								
Trans-1,3-Dichloropropene								
Trichloroethene	2.087				1.0	5.0		2.9
Benzene								
Dibromochloromethane								
Bromoform								
1,1,2,2-Tetrachloroethane								
Toluene								
Chlorbenzene								
Ethyl Benzene								
Carbon Disulfide								
4-Methyl-2-Pentanone								
Ethenyl Benzene								
O-Xylene (1,2-Dimethylbenzene)								
m & p Xylene (as m Xylene)								
2-Butanone (Methyl Ethyl Ketone)								
Cis-1,2-Dichloroethylene						2.9		
Vinyl Chloride								
Tetrachloroethylene	Trace							

IDPH 1988

Summary of Historical Sampling Results

Source: IDPH
Year: 1988

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l) Minimum	RANGES (ug/l) Maximum	MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL #	SAMPLES >/= MCL %	SAMPLES >/= 50% MCL #	SAMPLES >/= 50% MCL %	SAMPLES >/= PRS #	SAMPLES >/= PRS %
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluromethane											
1,1-Dichloroethene	8\17	ND	4	7	7	0	0.0%	1	5.9%	0	0.0%
1,1-Dichloroethane	8\17	ND	25								
Trans-1,2-Dichloroethene											
Chloroform	9\17	ND	7								
1,2-Dichloroethane	1\17			5	5						
1,1,1-Trichloroethane	13\17	2	140	200		0	0.0%	2	11.8%		
Carbon Tetrachloride	1\17			5	5						
Bromodichloromethane	1\17										
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	12\17	1	140	5	5	8	47.1%	10	58.8%	8	47.1%
Benzene				5	5						
Dibromochloromethane	1\17										
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	11\17	ND	14	5**	5	1	5.9%	6	35.3%	1	5.9%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/00/88 Cannon 2741	9/9/88 Cannon 2842	9/9/88 Cannon 2904	9/13/88 Hanson 2804	9/8/88 Horton 2922	10/10/88 Horton 2922	9/9/88 Horton 2926	8/9/88 Horton 3006	8/9/88 Lindberg 2413	8/9/88 Lindberg 2421
Chloromethane										
Bromoethane										
Chloroethane										
Methylene Chloride										
Trichlorofluoromethane										
1,1-Dichloroethene	2.0	1.2	1.4	3.8	1.3		1.1			
1,1-Dichloroethane	13.0	11.0	2.0	25.0	11.0		9.1			
Trans-1,2-Dichloroethene										
Chloroform	4.5		1.5	4.7	0.6	3.0	2.7	7.0		
1,2-Dichloroethane								1.7		
1,1,1-Trichloroethane	140.0	86.0	56.0	98.0	110.0	3.0	23.0	1.8	2.1	
Carbon Tetrachloride								0.9		
Bromodichloromethane								3.6		
1,2-Dichloropropane										
Trans-1,3-Dichloropropene										
Trichloroethene	140.0	40.0	6.4	68.0	51.0		12.0	2.7	1.1	0.7
Benzene										
Dibromochloromethane								7.0		
Bromoform										
1,1,2,2-Tetrachloroethane										
Toluene										
Chlorbenzene										
Ethyl Benzene										
Carbon Disulfide										
4-Methyl-2-Pentanone										
Ethenyl Benzene										
O-Xylene (1,2-Dimethylbenzene)										
m & p Xylene (as m Xylene)										
2-Butanone (Methyl Ethyl Ketone)										
Cis-1,2-Dichloroethylene										
Vinyl Chloride										
Tetrachloroethylene	4.8	0.9	0.2	3.2	2.0	Trace	2.7	2.6		

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/9/88 Lindberg 2818	8/9/89 Lund 2526	8/9/89 Ralph 7232	8/9/88 Sewell 2722	8/9/88 8th 3219	8/9/88 10th 3221	8/9/88 11th 2626
Chloromethane							
Bromoethane							
Chloroethane							
Methylene Chloride							
Trichlorofluoromethane							
1,1-Dichloroethene	0.4				0.1		0.5
1,1-Dichloroethane	1.0			0.2			8.7
Trans-1,2-Dichloroethene							
Chloroform	0.6				0.3		2.5
1,2-Dichloroethane							
1,1,1-Trichloroethane	16.0			3.2	4.8	1.7	94.0
Carbon Tetrachloride							
Bromodichloromethane							
1,2-Dichloropropane							
Trans-1,3-Dichloropropene							
Trichloroethene	6.1			0.5	2.8		20.0
Benzene							
Dibromochloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorbenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethenyl Benzene							
O-Xylene (1,2-Dimethylbenzene)							
m & p Xylene (as m Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethylene							
Vinyl Chloride							
Tetrachloroethylene	2.9				14.0	0.7	

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G101D

Matrix (soil/water): water Lab Sample ID: 200646-1

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____

Barretts Mobile Home

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	45U		P	
7440-38-2	Arsenic	1U		BH	
7440-39-3	Barium	[31]		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	5U		P	
7440-70-2	Calcium	76,300		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	39		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	25		F	
7439-95-4	Magnesium	30,900		P	
7439-96-5	Manganese	34		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2000]		P	
7782-49-2	Selenium	2U		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	32,000		P	
7440-28-0	Thallium	.5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

RECEIVED
SEP 12 1988
IEPA-DLPC

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: 6101D

Matrix (soil/water): Water Lab Sample ID: 200066-1

Level (low/Med): _____ Date Received: 8/30/98

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0 U			
	Phenol				
	Sulfate	45,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G1015

Matrix (soil/water): water Lab Sample ID: 2000603-2

Level (low/Med): _____ Date Received: 8/30/99

% Solids: _____ Barretts

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	224		P	
7440-36-0	Antimony	117		P	
7440-38-2	Arsenic	10.5		BH	
7440-39-3	Barium	59		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	14.0		P	
7440-70-2	Calcium	96,100		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	77		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	24		F	
7439-95-4	Magnesium	48,900		P	
7439-96-5	Manganese	[11]		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	6		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	67,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. EPA Sample No.: G1015

Matrix (soil/water): Water Lab Sample ID: 200066-2

Level (low/Med): _____ Date Received: 8/30/99

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0U			
	Phenol				
	Sulfate	54,000			
	Sulfide	1000U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G102

Matrix (soil/water): water Lab Sample ID: 200046-3

Level (low/Med): _____ Date Received: 8/30/98

% Solids: _____ Barrets

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	220		P	
7440-36-0	Antimony	70		P	
7440-38-2	Arsenic	12		BH	
7440-39-3	Barium	44		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	5		P	
7440-70-2	Calcium	81,400		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	57		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	.31		F	
7439-95-4	Magnesium	36,300		P	
7439-96-5	Manganese	9U		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[3200]		P	
7782-49-2	Selenium	4		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	46,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: G102

Matrix (soil/water): Water Lab Sample ID: 200066-3

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/l

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0			
	Phenol				
	Sulfate	33,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: 6103

Matrix (soil/water): water Lab Sample ID: 2000 46-4

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____ Barrets

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	86		P	
7440-38-2	Arsenic	1		BH	
7440-39-3	Barium	[37]		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	6		P	
7440-70-2	Calcium	81,800		P	
7440-47-3	Chromium	9		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	53		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	11		F	
7439-95-4	Magnesium	40,900		P	
7439-96-5	Manganese	9U		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	2U		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	26,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8 U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. EPA Sample No.: 6103

Matrix (soil/water): Water Lab Sample ID: 200066-4

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): mg/l

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0 U			
	Phenol				
	Sulfate	45,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

APPENDIX B

CLP SAS REQUEST FORMS

U.S. Environmental Protection Agency
CLP Sample Management Office
P.O. Box 818, Alexandria, Virgina 22313
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES
Client Request

X	Regional Transmittal			Telephone Request

A. EPA Region/Client: Region V

B. RSCC Representative: Jan Pels

C. Telephone Number: (312) 353-2720

D. Date of Request: May 1990

E. Site Name: Southeast Rockford Operable Unit

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water and/or residential well water for Arsenic, Cadmium, Chromium and Lead using detection limits lower than SOW 7/88 (See Attachment II). Arsenic, Cadmium and Lead are to be determined by GFAA using the method of standard additions. GFAA analysis of samples free of particulates may be conducted on the undigested sample. Chromium will be determined by ICP.

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

   144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates, will be collected over a 2 week period. Samples are water samples.

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

   Superfund Remedial State Lead

4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment I)

5. Estimated date(s) and method of shipment: Daily from June 4 to June 16 - Federal Express

insuring that the Tenax is fully enclosed within the heated zone of the trap thus eliminating potential cold spots. Alternatively, silanized glass wool may be used as a spacer at the trap inlet.

6.2.4 The desorber (Figure 2) must be capable of rapidly heating the trap to 180°C either prior to or at the beginning of the flow of desorption gas. The polymer section of the trap should not be heated higher than 200°C or the life expectancy of the trap will decrease. Trap failure is characterized by a pressure drop in excess of 3 pounds per square inch across the trap during purging or by poor bromoform sensitivities. The desorber design illustrated in Fig. 2 meets these criteria.

6.3 GAS CHROMATOGRAPHY/MASS SPECTROMETER/DATA SYSTEM (GC/MS/DS)

6.3.1 The GC must be capable of temperature programming and should be equipped with variable-constant differential flow controllers so that the column flow rate will remain constant throughout desorption and temperature program operation. The column oven must be cooled to 10°C; therefore, a subambient oven controller is required. If syringe injections of BFB will be used, a split/splitless injection port is required.

6.3.2 Capillary Gas Chromatography Columns. Any gas chromatography column that meets the performance specifications of this method may be used. Separations of the calibration mixture must be equivalent or better than those described in this method. Three useful columns have been identified.

6.3.2.1 Column 1 -- 60 m x 0.75 mm ID VOCOL (Supelco, Inc.) glass wide-bore capillary with a 1.5 μm film thickness.

Column 2 -- 30 m x 0.53 mm ID DB-624 (J&W Scientific, Inc.) fused silica capillary with a 3 μm film thickness.

Column 3 -- 30 m x 0.32 mm ID DB-5 (J&W Scientific, Inc.) fused silica capillary with a 1 μm film thickness.

6.3.3 Interfaces between the GC and MS. The interface used depends on the column selected and the gas flow rate.

6.3.3.1 The wide-bore columns 1 and 2 have the capacity to accept the standard gas flows from the trap during thermal desorption, and chromatography can begin with the onset of thermal desorption. Depending on the pumping capacity of the MS, an additional interface between the end of the column and the MS may be required. An open split interface (7), an all-glass jet separator, or a cryogenic (Sect. 6.3.3.2) device

are acceptable interfaces. Any interface can be used if the performance specifications described in this method can be achieved. The end of the transfer line after the interface, or the end of the analytical column if no interface is used, should be placed within a few mm of the MS ion source.

6.3.3.2 The narrow bore column 3 cannot accept the thermal desorption gas flow, and a cryogenic interface is required. This interface (Tekmar Model 1000 or equivalent) condenses the desorbed sample components at liquid nitrogen temperature, and allows the helium gas to pass through to an exit. The condensed components are frozen in a narrow band on an uncoated fused silica precolumn. When all components have been desorbed from the trap, the interface is rapidly heated under a stream of carrier gas to transfer the analytes to the analytical column. The end of the analytical column should be placed with a few mm of the MS ion source. A potential problem with this interface is blockage of the interface by frozen water from the trap. This condition will result in a major loss in sensitivity and chromatographic resolution.

6.3.4 The mass spectrometer must be capable of electron ionization at a nominal electron energy of 70 eV.[3] The spectrometer must be capable of scanning from 35 to 260 amu with a complete scan cycle time (including scan overhead) of 2 sec or less. (Scan cycle time = Total MS data acquisition time in seconds divided by number of scans in the chromatogram). The spectrometer must produce a mass spectrum that meets all criteria in Table 3 when 25 ng or less of 4-bromofluorobenzene (BFB) is introduced into the GC. An average spectrum across the BFB GC peak may be used to test instrument performance.

6.3.5 An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored GC/MS data by recognizing a GC peak within any given retention time window, comparing the mass spectra from the GC peak with spectral data in a user-created data base, and generating a list of tentatively identified compounds with their retention times and scan numbers. The software must allow integration of the ion abundance of any specific ion between specified time or scan number limits. The software should also allow calculation of response factors as defined in Sect. 9.2.6 (or construction of a second or third order regression calibration curve), calculation of response factor statistics (mean and standard deviation), and calculation of concentrations of analytes using either the calibration curve or the equation in Sect. 12.

6.4 SYRINGE AND SYRINGE VALVES

6.4.1 Two 5-mL or 25-mL glass hypodermic syringes with Luer-Lok tip (depending on sample volume used).

6.4.2 Three 2-way syringe valves with Luer ends.

6.4.3 One 25-µL micro syringe with a 2 in x 0.006 in ID, 22° bevel needle (Hamilton #702N or equivalent).

6.4.4 Micro syringes - 10, 100 µL.

6.4.5 Syringes - 0.5, 1.0, and 5-mL, gas tight with shut-off valve.

6.5 MISCELLANEOUS

6.5.1 Standard solution storage containers -- 15-mL bottles with PTFE-lined screw caps.

7. REAGENTS AND CONSUMABLE MATERIALS

7.1 TRAP PACKING MATERIALS

7.1.1 2,6-Diphenylene oxide polymer, 60/80 mesh, chromatographic grade (Tenax GC or equivalent).

7.1.2 Methyl silicone packing (optional) -- OV-1 (3%) on Chromosorb W, 60/80 mesh, or equivalent.

7.1.3 Silica gel -- 35/60 mesh, Davison, grade 15 or equivalent.

7.1.4 Coconut charcoal -- Prepare from Barnebey Cheney, CA-580-26 lot #M-2649 by crushing through 26 mesh screen.

7.2 REAGENTS

7.2.1 Methanol -- Demonstrated to be free of analytes.

7.2.2 Reagent water -- Prepare reagent water by passing tap water through a filter bed containing about 0.5 kg of activated carbon, by using a water purification system, or by boiling distilled water for 15 min followed by a 1-h purge with inert gas while the water temperature is held at 90°C. Store in clean, narrow-mouth bottles with PTFE-lined septa and screw caps.

7.2.3 Hydrochloric acid (1+1) -- Carefully add measured volume of conc. HCl to equal volume of reagent water.

7.2.4 Vinyl chloride -- Certified mixtures of vinyl chloride in nitrogen and pure vinyl chloride are available from several

sources (for example, Matheson, Ideal Gas Products, and Scott Gases).

7.2.5 Ascorbic acid -- ACS reagent grade, granular.

7.3 STOCK STANDARD SOLUTIONS -- These solutions may be purchased as certified solutions or prepared from pure standard materials using the following procedures. One of these solutions is required for every analyte of concern, every surrogate, and the internal standard. A useful working concentration is about 1-5 mg/mL.

7.3.1 Place about 9.8 mL of methanol into a 10-mL ground-glass stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min or until all alcohol-wetted surfaces have dried and weigh to the nearest 0.1 mg.

7.3.2 If the analyte is a liquid at room temperature, use a 100-µL syringe and immediately add two or more drops of reference standard to the flask. Be sure that the reference standard falls directly into the alcohol without contacting the neck of the flask. If the analyte is a gas at room temperature, fill a 5-mL valved gas-tight syringe with the standard to the 5.0-mL mark, lower the needle to 5 mm above the methanol meniscus, and slowly inject the standard into the neck area of the flask. The gas will rapidly dissolve in the methanol.

7.3.3 Reweigh, dilute to volume, stopper, then mix by inverting the flask several times. Calculate the concentration in µg/µL from the net gain in weight. When compound purity is certified at 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard.

7.3.4 Store stock standard solutions in 15-mL bottles equipped with PTFE-lined screw caps. Methanol solutions prepared from liquid analytes are stable for at least 4 weeks when stored at 4°C. Methanol solutions prepared from gaseous analytes are not stable for more than 1 week when stored at <0°C; at room temperature, they must be discarded after 1 day.

7.4 PRIMARY DILUTION STANDARDS -- Use stock standard solutions to prepare primary dilution standard solutions that contain all the analytes of concern and the surrogates (but not the internal standard!) in methanol. The primary dilution standards should be prepared at concentrations that can be easily diluted to prepare aqueous calibration solutions that will bracket the working concentration range. Store the primary dilution standard solutions with minimal headspace and check frequently for signs of deterioration or evaporation, especially just before preparing calibration solutions. Storage times described for stock standard solutions in Sect. 7.4.4 also apply to primary dilution standard solutions.

7.5 FORTIFICATION SOLUTIONS FOR INTERNAL STANDARD AND SURROGATES

7.5.1 A solution containing the internal standard and the surrogates is required to prepare laboratory reagent blanks (also used as a laboratory performance check solution), and to fortify each sample. Prepare a fortification solution containing fluorobenzene (internal standard), 1,2- dichlorobenzene-d_4 (surrogate), and BFB (surrogate) in methanol at concentrations of 5 µg/mL of each. A 5-µL aliquot of this solution added to a 25-mL water sample volume gives concentrations of 1 µg/L of each. A 5-µL aliquot of this solution added to a 5-mL water sample volume gives a concentration of 5 µg/L of each). Additional internal standrds and surrogate analytes are optional.

7.5.2 A solution of the internal standard alone is required to prepare calibration standards and laboratory fortified blanks. The internal standard should be in methanol at a concentration of 5 µg/mL.

7.6 PREPARATION OF LABORATORY REAGENT BLANK -- Fill a 25-mL (or 5-mL) syringe with reagent water and adjust to the mark (no air bubbles). Inject 10 µL of the fortification solution containing the internal standard and surrogates through the Luer Lok valve into the reagent water. Transfer the LRB to the purging device. See Sect. 11.1.2.

7.7 PREPARATION OF LABORATORY FORTIFIED BLANK -- Prepare this exactly like a calibration standard (Sect. 7.8). This is a calibration standard that is treated as a sample.

7.8 PREPARATION OF CALIBRATION STANDARDS

7.8.1 The number of calibration solutions (CALs) needed depends on the calibration range desired. A minimum of three CAL solutions is required to calibrate a range of a factor of 20 in concentration. For a factor of 50, use at least four standards, and for a factor of 100 at least five standards. One calibration standard should contain each analyte of concern and each surrogate at a concentration of 2-10 times the method detection limit (Tables 4-6) for that compound. The other CAL standards should contain each analyte of concern and each surrogate at concentrations that define the range of the method. Every CAL solution contains the internal standard at the same concentration (5 µg/L suggested for a 5-mL sample; 1 µg/L for a 25-mL sample).

7.8.2 To prepare a calibration standard, add an appropriate volume of a primary dilution standard (containing analytes and surrogates) to an aliquot of reagent water in a volumetric flask. Use a microsyringe and rapidly inject the methanol solutions into the expanded area of the filled volumetric flask. Remove the needle as quickly as possible after injection. Mix by inverting the

flask three times only. Discard the contents contained in the neck of the flask. Aqueous standards are not stable in a volumetric flask and should be discarded after 1 hr unless transferred to a sample bottle and sealed immediately.

8. SAMPLE COLLECTION, PRESERVATION, AND STORAGE

8.1 SAMPLE COLLECTION, DECHLORINATION, AND PRESERVATION

8.1.1 Collect all samples in duplicate. If samples contain residual chlorine, and measurements of the concentrations of disinfection by-products (trihalomethanes, etc.) at the time of sample collection are desired, add about 25 mg of ascorbic acid to the sample bottle before filling. Fill sample bottles to overflowing, but take care not to flush out the rapidly dissolving ascorbic acid. No air bubbles should pass through the sample as the bottle is filled, or be trapped in the sample when the bottle is sealed. Adjust the pH of the duplicate samples to <2 by carefully adding one drop of 1:1 HCl for each 20 mL of sample volume. Seal the sample bottles, PFTE-face down, and shake vigorously for 1 min.

8.1.2 When sampling from a water tap, open the tap and allow the system to flush until the water temperature has stabilized (usually about 10 min). Adjust the flow to about 500 mL/min and collect duplicate samples from the flowing stream.

8.1.3 When sampling from an open body of water, fill a 1-quart wide-mouth bottle or 1-liter beaker with sample from a representative area, and carefully fill duplicate sample bottles from the 1-quart container.

8.1.4 The samples must be chilled to 4°C on the day of collection and maintained at that temperature until analysis. Field samples that will not be received at the laboratory on the day of collection must be packaged for shipment with sufficient ice to ensure that they will be at 4°C on arrival at the laboratory.

8.2 SAMPLE STORAGE

8.2.1 Store samples at 4°C until analysis. The sample storage area must be free of organic solvent vapors.

8.2.2 Analyze all samples within 14 days of collection. Samples not analyzed within this period must be discarded and replaced.

8.3 FIELD REAGENT BLANKS

8.3.1 Duplicate field reagent blanks must be handled along with each sample set, which is composed of the samples collected from the same general sample site at approximately the same time. At the laboratory, fill field blank sample bottles with reagent

water, seal, and ship to the sampling site along with empty sample bottles and back to the laboratory with filled sample bottles. Wherever a set of samples is shipped and stored, it is accompanied by appropriate blanks.

8.3.2 Use the same procedures used for samples to add ascorbic acid and HCl to blanks (Sect. 8.1.1).

9. CALIBRATION

9.1 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed and is required intermittently throughout sample analysis as dictated by results of continuing calibration checks. After initial calibration is successful, a continuing calibration check is required at the beginning of each 8 hr. period during which analyses are performed. Additional periodic calibration checks are good laboratory practice.

9.2 Initial calibration

9.2.1 Calibrate the mass and abundance scales of the MS with calibration compounds and procedures prescribed by the manufacturer with any modifications necessary to meet the requirements in Sect. 9.2.2.

9.2.2 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire mass spectra for m/z 35-260 at 70 eV (nominal). Use the purging procedure and/or GC conditions given in Sect. 11. If the spectrum does not meet all criteria in Table 2, the MS must be retuned and adjusted to meet all criteria before proceeding with calibration. An average spectrum across the GC peak may be used to evaluate the performance of the system.

9.2.3 Purge a medium CAL solution, for example 10-20 µg/L, using the procedure given in Sect. 11.

9.2.4 Performance criteria for the medium calibration. Examine the stored GC/MS data with the data system software. Figure 3 shows an acceptable total ion chromatogram.

9.2.4.1 GC performance. Good column performance will produce symmetrical peaks with minimum tailing for most compounds. If peaks are broad, or sensitivity poor, see Sect. 9.3.6 for some possible remedial actions.

9.2.4.2 MS sensitivity. The GC/MS/DS peak identification software should be able to recognize a GC peak in the appropriate retention time window for each of the compounds in calibration solution, and make correct tentative identifications. If fewer than 99% of the

compounds are recognized, system maintenance is required. See Sect. 9.3.6.

9.2.5 If all performance criteria are met, purge an aliquot of each of the other CAL solutions using the same GC/MS conditions.

9.2.6 Calculate a response factor (RF) for each analyte, surrogate, and isomer pair for each CAL solution using the internal standard fluorobenzene. Table 1 contains suggested quantitation ions for all compounds. This calculation is supported in acceptable GC/MS data system software (Sect. 6.3.4), and many other software programs. RF is a unitless number, but units used to express quantities of analyte and internal standard must be equivalent.

$$RF = \frac{(A_x)(Q_{is})}{(A_{is})(Q_x)}$$

where: A_x = integrated abundance of the quantitation ion of the analyte.
A_{is} = integrated abundance of the quantitation ion of the internal standard.
Q_x = quantity of analyte purged in ng or concentration units.
Q_{is} = quantity of internal standard purged in ng or concentration units.

9.2.6.1 For each analyte and surrogate, calculate the mean RF from the analyses of the CAL solutions. Calculate the standard deviation (SD) and the relative standard deviation (RSD) from each mean: RSD = 100 (SD/M). If the RSD of any analyte or surrogate mean RF exceeds 20%, either analyze additional aliquots of appropriate CAL solutions to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance. See Sect. 9.2.7.

9.2.7 As an alternative to calculating mean response factors and applying the RSD test, use the GC/MS data system software or other available software to generate a second or third order regression calibration curve.

9.3 Continuing calibration check. Verify the MS tune and initial calibration at the beginning of each 8-hr work shift during which analyses are performed using the following procedure.

9.3.1 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire a mass spectrum that includes data for m/z 35-260. If the spectrum does not meet all criteria (Table 2), the MS must be

retuned and adjusted to meet all criteria before proceeding with the continuing calibration check.

9.3.2 Purge a medium concentration CAL solution and analyze with the same conditions used during the initial calibration.

9.3.3 Demonstrate acceptable performance for the criteria shown in Sect. 9.2.4.

9.3.4 Determine that the absolute areas of the quantitation ions of the internal standard and surrogates have not decreased by more than 30% from the areas measured in the most recent continuing calibration check, or by more than 50% from the areas measured during initial calibration. If these areas have decreased by more than these amounts, adjustments must be made to restore system sensitivity. These adjustments may require cleaning of the MS ion source, or other maintenance as indicated in Sect. 9.3.6, and recalibration. Control charts are useful aids in documenting system sensitivity changes.

9.3.5 Calculate the RF for each analyte and surrogate from the data measured in the continuing calibration check. The RF for each analyte and surrogate must be within 30% of the mean value measured in the initial calibration. Alternatively, if a second or third order regression is used, the point from the continuing calibration check for each analyte and surrogate must fall, within the analyst's judgement, on the curve from the initial calibration. If these conditions do not exist, remedial action must be taken which may require re-initial calibration.

9.3.6 Some possible remedial actions. Major maintenance such as cleaning an ion source, cleaning quadrupole rods, etc. require returning to the initial calibration step.

9.3.6.1 Check and adjust GC and/or MS operating conditions; check the MS resolution, and calibrate the mass scale.

9.3.6.2 Clean or replace the splitless injection liner; silanize a new injection liner.

9.3.6.3 Flush the GC column with solvent according to manufacturer's instructions.

9.3.6.4 Break off a short portion (about 1 meter) of the column from the end near the injector; or replace GC column. This action will cause a change in retention times.

9.3.6.5 Prepare fresh CAL solutions, and repeat the initial calibration step.

9.3.6.6 Clean the MS ion source and rods (if a quadrupole).

9.3.6.7 Replace any components that allow analytes to come into contact with hot metal surfaces.

9.3.6.8 Replace the MS electron multiplier, or any other faulty components.

9.4 Optional calibration for vinyl chloride using a certified gaseous mixture of vinyl chloride in nitrogen can be accomplished by the following steps.

9.4.1 Fill the purging device with 25.0 mL (or 5-mL) of reagent water or aqueous calibration standard.

9.4.2 Start to purge the aqueous mixture. Inject a known volume (between 100 and 2000 µL) of the calibration gas (at room temperature) directly into the purging device with a gas tight syringe. Slowly inject the gaseous sample through a septum seal at the top of the purging device at 2000 µL/min. If the injection of the standard is made through the aqueous sample inlet port, flush the dead volume with several mL of room air or carrier gas. Inject the gaseous standard before 5 min of the 11-min purge time have elapsed.

9.4.3 Determine the aqueous equivalent concentration of vinyl chloride standard, in µg/L, injected with the equation:

$$S = 0.102\ (C)(V)$$

where S = Aqueous equivalent concentration of vinyl chloride standard in µg/L;
C = Concentration of gaseous standard in ppm (v/v);
V = Volume of standard injected in milliliters.

10. QUALITY CONTROL

10.1 Quality control (QC) requirements are the initial demonstration of laboratory capability followed by regular analyses of laboratory reagent blanks, field reagent blanks, and laboratory fortified blanks. The laboratory must maintain records to document the quality of the data generated. Additional quality control practices are recommended.

10.2 Initial demonstration of low system background. Before any samples are analyzed, it must be demonstrated that a laboratory reagent blank (LRB) is reasonably free of contamination that would prevent the determination of any analyte of concern. Sources of background contamination are glassware, purge gas, sorbants, and equipment. Background contamination must be reduced to an acceptable level before proceeding with the next section. In general, background from method analytes should be below the method detection limit.

10.3 Initial demonstration of laboratory accuracy and precision. Analyze five to seven replicates of a laboratory fortified blank containing each analyte of concern at a concentration in the range of 0.2-5 µg/L (see regulations and maximum contaminant levels for guidance on appropriate concentrations).

10.3.1 Prepare each replicate by adding an appropriate aliquot of a quality control sample to reagent water. If a quality control sample containing the method analytes is not available, a primary dilution standard made from a source of reagents different than those used to prepare the calibration standards may be used. Also add the appropriate amounts of internal standard and surrogates if they are being used. Analyze each replicate according to the procedures described in Section 11, and on a schedule that results in the analyses of all replicates over a period of several days.

10.3.2 Calculate the measured concentration of each analyte in each replicate, the mean concentration of each analyte in all replicates, and mean accuracy (as mean percentage of true value) for each analyte, and the precision (as relative standard deviation, RSD) of the measurements for each analyte. Calculate the MDL of each analyte using the procedures described in Sect. 13.2 (2).

10.3.3 For each analyte and surrogate, the mean accuracy, expressed as a percentage of the true value, should be 80-120% and the RSD should be <20%. Some analytes, particularly the early eluting gases and late eluting higher molecular weight compounds, are measured with less accuracy and precision than other analytes. The method detection limits must be sufficient to detect analytes at the required levels. If these criteria are not met for an analyte, take remedial action and repeat the measurements for that analyte to demonstrate acceptable performance before samples are analyzed.

10.3.4 Develop and maintain a system of control charts to plot the precision and accuracy of analyte and surrogate measurements as a function of time. Charting of surrogate recoveries is an especially valuable activity since these are present in every sample and the analytical results will form a significant record of data quality.

10.4 Monitor the integrated areas of the quantitation ions of the internal standards and surrogates in continuing calibration checks. These should remain reasonably constant over time. A drift of more than 50% in any area is indicative of a loss in sensitivity, and the problem must be found and corrected. These integrated areas should also be reasonably constant in laboratory fortified blanks and samples.

10.5 Laboratory reagent blanks. With each batch of samples processed as a group within a work shift, analyze a laboratory reagent blank to determine the background system contamination. A FRB (Sect. 10.7) may be used in place of a LRB.

10.6 With each batch of samples processed as a group within a work shift, analyze a single laboratory fortified blank (LFB) containing each analyte of concern at a concentration as determined in 10.3. If more than 20 samples are included in a batch, analyze one LFB for every 20 samples. Use the procedures described in 10.3.3 to evaluate the accuracy of the measurements, and to estimate whether the method detection limits can be obtained. If acceptable accuracy and method detection limits cannot be achieved, the problem must be located and corrected before further samples are analyzed. Add these results to the on-going control charts to document data quality.

10.7 With each set of field samples a field reagent blank (FRB) should be analyzed. The results of these analyses will help define contamination resulting from field sampling and transportation activities. If the FRB shows unacceptable contamination, a LRB must be measured to define the source of the impurities.

10.8 At least quarterly, replicates of laboratory fortified blanks should be analyzed to determine the precision of the laboratory measurements. Add these results to the on-going control charts to document data quality.

10.9 At least quarterly, analyze a quality control sample (QCS) from an external source. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem source.

10.10 Sample matrix effects have not been observed when this method is used with distilled water, reagent water, drinking water, and ground water. Therefore, analysis of a laboratory fortified sample matrix (LFM) is not required. It is recommended that sample matrix effects be evaluated at least quarterly using the QCS described in 10.9.

10.11 Numerous other quality control measures are incorporated into other parts of this procedure, and serve to alert the analyst to potential problems.

11. PROCEDURE

11.1 SAMPLE INTRODUCTION AND PURGING

11.1.1 This method is designed for a 25-mL sample volume, but a smaller (5 mL) sample volume is recommended if the GC/MS system has adequate sensitivity to achieve the required method detection limits. Adjust the purge gas (nitrogen or helium) flow rate to 40 mL/min. Attach the trap inlet to the

purging device and open the syringe valve on the purging device.

11.1.2 Remove the plungers from two 25-mL (or 5-mL depending on sample size) syringes and attach a closed syringe valve to each. Warm the sample to room temperature, open the sample bottle, and carefully pour the sample into one of the syringe barrels to just short of overflowing. Replace the syringe plunger, invert the syringe, and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 25.0-mL (or 5-mL). For samples and blanks, add 5-µL of the fortification solution containing the internal standard and the surrogates to the sample through the syringe valve. For calibration standards and laboratory fortified blanks, add 5-µL of the fortification solution containing the internal standard only. Close the valve. Fill the second syringe in an identical manner from the same sample bottle. Reserve this second syringe for a reanalysis if necessary.

11.1.3 Attach the sample syringe valve to the syringe valve on the purging device. Be sure that the trap is cooler than 25°C, then open the sample syringe valve and inject the sample into the purging chamber. Close both valves and initiate purging. Purge the sample for 11.0 min at ambient temperature.

11.2 SAMPLE DESORPTION

11.2.1 Non-cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode and preheat the trap to 180°C without a flow of desorption gas. Then simultaneously start the flow of desorption gas at 15-mL/min for about 4 min, begin the temperature program of the gas chromatograph, and start data acquisition.

11.2.2 Cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode, make sure the cryogenic interface is a -150°C or lower, and rapidly heat the trap to 180°C while backflushing with an inert gas at 4 mL/min for about 5 min. At the end of the 5 min desorption cycle, rapidly heat the cryogenic trap to 250°C, and simultaneously begin the temperature program of the gas chromatograph, and start data acquisition.

11.2.3 While the trapped components are being introduced into the gas chromatograph (or cryogenic interface), empty the purging device using the sample syringe and wash the chamber with two 25-mL flushes of reagent water. After the purging device has been emptied, leave syringe valve open to allow the purge gas to vent through the sample introduction needle.

11.3 GAS CHROMATOGRAPHY/MASS SPECTROMETRY -- Acquire and store data over the mass range 35-260 with a total cycle time (including scan overhead time) of 2 sec or less. Cycle time must be adjusted to measure five or more spectra during the elution of each GC peak. Several alternative temperature programs can be used.

11.3.1 Single ramp linear temperature program for wide bore columns 1 and 2 with a jet separator. Adjust the helium carrier gas flow rate to about 15 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of desorption, then programmed to 160°C at 6°C/min, and held until all components have eluted.

11.3.2 Multi-ramp linear temperature program for wide bore column 2 with the open split interface. Adjust the helium carrier gas flow rate to about 4.6 mL/min. The column temperature is reduced 10°C and held for 6 min from the beginning of desorption, then heated to 70°C at 10°/min, heated to 120°C at 5°/min, heated to 180° at 8°/min, and held at 180° until all compounds have eluted.

11.3.3 Single ramp linear temperature program for narrow bore column 3 with a cryogenic interface. Adjust the helium carrier gas flow rate to about 4 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of vaporization from the cryogenic trap, programmed at 6°C/min for 10 min, then 15°C/min for 5 min to 145°C, and held until all components have eluted.

11.4 TRAP RECONDITIONING -- After desorbing the sample for 4 min, recondition the trap by returning the purge and trap system to the purge mode. Wait 15 sec, then close the syringe valve on the purging device to begin gas flow through the trap. Maintain the trap temperature at 180°C. After approximately 7 min, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When the trap is cool, the next sample can be analyzed.

11.5 TERMINATION OF DATA ACQUISITION -- When all the sample components have eluted from the GC, terminate MS data acquisition. Use appropriate data output software to display full range mass spectra and appropriate plots of ion abundance as a function of time. If any ion abundance exceeds the system working range, dilute the sample aliquot in the second syringe with reagent water and analyze the diluted aliquot.

11.6 IDENTIFICATION OF ANALYTES -- Identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in the user-created data base. The GC retention time of the sample component should be within three standard deviations of the mean retention time of the compound in the calibration mixture.

11.6.1 In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and should agree within absolute 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10 to 50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.

11.6.2 Identification requires expert judgement when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components. When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. Because purgeable organic compounds are relatively small molecules and produce comparatively simple mass spectra, this is not a significant problem for most method analytes.

11.6.3 Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks. Otherwise, structural isomers are identified as isomeric pairs. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary columns. If unresolved, these groups of isomers must be reported as isomeric pairs.

11.6.4 Methylene chloride and other background components appear in variable quantities in laboratory and field reagent blanks, and generally cannot be accurately measured. Subtraction of the concentration in the blank from the concentration in the sample is not acceptable because the concentration of the background in the blank is highly variable.

12. CALCULATIONS

12.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations if unique ions with adequate intensities are available for quantitation.

12.1.1 Calculate analyte and surrogate concentrations.

$$C_x = \frac{(A_x)(Q_{is})\ 1000}{(A_{is})\ RF\ V}$$

where: C_x = concentration of analyte or surrogate in µg/L in the water sample.
A_x = integrated abundance of the quantitation ion of the analyte in the sample.
A_{is} = integrated abundance of the quantitation ion of the internal standard in the sample.
Q_{is} = total quantity (in micrograms) of internal standard added to the water sample.
V = original water sample volume in mL.
RF = mean response factor of analyte from the initial calibration.

12.1.2 Alternatively, use the GC/MS system software or other available proven software to compute the concentrations of the analytes and surrogates from the second or third order regression curves.

12.1.3 Calculations should utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty). Experience indicates that three significant figures may be used for concentrations above 99 µg/L, two significant figures for concentrations between 1- 99 µg/L, and one significant figure for lower concentrations.

12.1.4 Calculate the total trihalomethane concentration by summing the four individual trihalomethane concentrations in µg/L.

13. ACCURACY AND PRECISION

13.1 Single laboratory accuracy and precision data were obtained for the method analytes using laboratory fortified blanks with analytes at concentrations between 1 and 5 µg/L. Four sets of results were obtained using the three columns specified (Sect. 6.3.2) and the open split, cryogenic, and jet separator interfaces (Sect. 6.3.3). These data are shown in Tables 4-6.

13.2 With these data, method detection limits were calculated using the formula (2):

$$MDL = S\ t_{(n-1,1\text{-alpha} = 0.99)}$$

where:

$t_{(n-1,1\text{-alpha} = 0.99)}$ = Student's t value for the 99% confidence level with n-1 degrees of freedom,

n = number of replicates

S = the standard deviation of the replicate analyses.

14. REFERENCES

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TABLE 1. MOLECULAR WEIGHTS AND QUANTITATION IONS FOR METHOD ANALYTES

Compound	MW[a]	Primary Quantitation Ion	Secondary Quantitation Ions
Internal standard			
Fluorobenzene	96	96	77
Surrogates			
4-Bromofluorobenzene	174	95	174,176
1,2-Dichlorobenzene-d4	150	152	115,150
Target Analytes			
Benzene	78	78	77
Bromobenzene	156	156	77,158
Bromochloromethane	128	128	49,130
Bromodichloromethane	162	83	85,127
Bromoform	250	173	175,252
Bromomethane	94	94	96
n-Butylbenzene	134	91	134
sec-Butylbenzene	134	105	134
tert-Butylbenzene	134	119	91
Carbon tetrachloride	152	117	119
Chlorobenzene	112	112	77,114
Chloroethane	64	64	66
Chloroform	118	83	85
Chloromethane	50	50	52
2-Chlorotoluene	126	91	126
4-Chlorotoluene	126	91	126
Dibromochloromethane	206	129	127
1,2-Dibromo-3-Chloropropane	234	75	155,157
1,2-Dibromoethane	186	107	109,188
Dibromomethane	172	93	95,174
1,2-Dichlorobenzene	146	146	111,148
1,3-Dichlorobenzene	146	146	111,148
1,4-Dichlorobenzene	146	146	111,148
Dichlorodifluoromethane	120	85	87
1,1-Dichloroethane	98	63	65,83
1,2-Dichloroethane	98	62	98
1,1-Dichloroethene	96	96	61,63
cis-1,2-Dichloroethene	96	96	61,98
trans-1,2-Dichloroethene	96	96	61,98
1,2-Dichloropropane	112	63	112
1,3-Dichloropropane	112	76	78
2,2-Dichloropropane	112	77	97
1,1-Dichloropropene	110	75	110,77

TABLE 1. (continued)

Compound	MW[a]	Primary Quantitation Ion	Secondary Quantitation Ions
cis-1,3-dichloropropene	110	75	110
trans-1,3-dichloropropene	110	75	110
Ethylbenzene	106	91	106
Hexachlorobutadiene	258	225	260
Isopropylbenzene	120	105	120
4-Isopropyltoluene	134	119	134,91
Methylene chloride	84	84	86,49
Naphthalene	128	128	
n-Propylbenzene	120	91	120
Styrene	104	104	78
1,1,1,2-Tetrachloroethane	166	131	133,119
1,1,2,2-Tetrachloroethane	166	83	131,85
Tetrachloroethene	164	166	168,129
Toluene	92	92	91
1,2,3-Trichlorobenzene	180	180	182
1,2,4-Trichlorobenzene	180	180	182
1,1,1-Trichloroethane	132	97	99,61
1,1,2-Trichloroethane	132	83	97,85
Trichloroethene	130	95	130,132
Trichlorofluoromethane	136	101	103
1,2,3-Trichloropropane	146	75	77
1,2,4-Trimethylbenzene	120	105	120
1,3,5-Trimethylbenzene	120	105	120
Vinyl Chloride	62	62	64
o-Xylene	106	106	91
m-Xylene	106	106	91
p-Xylene	106	106	91

[a]Monoisotopic molecular weight calculated from the atomic masses of the isotopes with the smallest masses.

TABLE 2. CHROMATOGRAPHIC RETENTION TIMES FOR METHOD ANALYTES ON THREE COLUMNS WITH FOUR SETS OF CONDITIONS[a]

Compound	Retention Time (min:sec) Column 1[b]	Column 2[b]	Column 2[c]	Column 3[d]
Internal standard				
Fluorobenzene	8:49	6:27	14:06	8:03
Surrogates				
4-Bromofluorobenzene	18:38	15:43	23:38	
1,2-Dichlorobenzene-d4	22:16	19:08	27:25	
Target Analytes				
Benzene	8:14	5:40	13:30	7:25
Bromobenzene	18:57	15:52	24:00	16:25
Bromochloromethane	6:44	4:23	12:22	5:38
Bromodichloromethane	10:35	8:29	15:48	9:20
Bromoform	17:56	14:53	22:46	15:42
Bromomethane	2:01	0:58	4:48	1:17
n-Butylbenzene	22:13	19:29	27:32	17:57
sec-Butylbenzene	20:47	18:05	26:08	17:28
tert-Butylbenzene	20:17	17:34	25:36	17:19
Carbon Tetrachloride	7:37	5:16	13:10	7:25
Chlorobenzene	15:46	13:01	20:40	14:20
Chloroethane	2:05	1:01		1:27
Chloroform	6:24	4:48	12:36	5:33
Chloromethane	1:38	0:44	3:24	0:58
2-Chlorotoluene	19:20	16:25	24:32	16:44
4-Chlorotoluene	19:30	16:43	24:46	16:49
Cyanogen chloride				1:03
Dibromochloromethane	14:23	11:51	19:12	12:48
1,2-Dibromo-3-Chloropropane	24:32	21:05		18:02
1,2-Dibromoethane	14:44	11:50	19:24	13:36
Dibromomethane	10:39	7:56	15:26	9:05
1,2-Dichlorobenzene	22:31	19:10	27:26	17:47
1,3-Dichlorobenzene	21:13	18:08	26:22	17:28
1,4-Dichlorobenzene	21:33	18:23	26:36	17:38
Dichlorodifluoromethane	1:33	0:42	3:08	0:53
1,1-Dichloroethane	4:51	2:56	10:48	4:02
1,2-Dichloroethane	8:24	5:50	13:38	7:00
1,1-Dichloroethene	2:53	1:34	7:50	2:20
cis-1,2-Dichloroethene	6:11	3:54	11:56	5:04
trans-1,2-Dichloroethene	3:59	2:22	9:54	3:32
1,2-Dichloropropane	10:05	7:40	15:12	8:56
1,3-Dichloropropane	14:02	11:19	18:42	12:29
2,2-Dichloropropane	6:01	3:48	11:52	5:19
1,1-Dichloropropene	7:49	5:17	13:06	7:10

TABLE 2. (continued)

Compound	Retention Time (min:sec) Column 1[b]	Column 2[b]	Column 2[c]	Column 3[d]
cis-1,3-dichloropropene			17:54	
trans-1,3-dichloropropene			16:42	
Ethylbenzene	15:59	13:23	21:00	14:44
Hexachlorobutadiene	26:59	23:41	32:04	19:14
Isopropylbenzene	13:04	15:28	23:18	16:25
4-Isopropyltoluene	21:12	18:31	26:30	17:38
Methylene Chloride	3:36	2:04	9:16	2:40
Naphthalene	27:10	23:31	32:12	19:04
n-Propylbenzene	19:04	16:25	24:20	16:49
Styrene	17:19	14:36	22:24	15:47
1,1,1,2-Tetrachloroethane	15:56	13:20	20:52	14:44
1,1,2,2-Tetrachloroethane	18:43	16:21	24:04	15:47
Tetrachloroethene	13:44	11:09	18:36	13:12
Toluene	12:26	10:00	17:24	11:31
1,2,3-Trichlorobenzene	27:47	24:11	32:58	19:14
1,2,4-Trichlorobenzene	26:33	23:05	31:30	18:50
1,1,1-Trichloroethane	7:16	4:50	12:50	6:46
1,1,2-Trichloroethane	13:25	11:03	18:18	11:59
Trichloroethene	9:35	7:16	14:48	9:01
Trichlorofluoromethane	2:16	1:11	6:12	1:46
1,2,3-Trichloropropane	19:01	16:14	24:08	16:16
1,2,4-Trimethylbenzene	20:20	17:42	31:30	17:19
1,3,5-Trimethylbenzene	19:28	16:54	24:50	16:59
Vinyl chloride	1:43	0:47	3:56	1:02
o-Xylene	17:07	14:31	22:16	15:47
m-Xylene	16:10	13:41	21:22	15:18
p-Xylene	16:07	13:41	21:18	15:18

[a]Columns 1-3 are those given in Sect. 6.3.2.1; retention times were measured from the beginning of thermal desorption from the trap (columns 1-2) or from the beginning of thermal release from the cryogenic interface (column 3).
[b]GC conditions given in Sect. 11.3.1.
[c]GC conditions given in Sect. 11.3.2.
[d]GC conditions given in Sect. 11.3.3.

TABLE 3. ION ABUNDANCE CRITERIA FOR 4-BROMOFLUOROBENZENE (BFB)

Mass (M/z)	Relative Abundance Criteria
50	15 to 40% of mass 95
75	30 to 80% of mass 95
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5 to 9% of mass 174
176	> 95% but < 101% of mass 174
177	5 to 9% of mass 176

TABLE 4. ACCURACY AND PRECISION DATA FROM 16-31 DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE CAPILLARY COLUMN 1[a]

Compound	True Conc. Range (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit (µg/L)
Benzene	0.1-10	97	5.7	0.04
Bromobenzene	0.1-10	100	5.5	0.03
Bromochloromethane	0.5-10	90	6.4	0.04
Bromodichloromethane	0.1-10	95	6.1	0.08
Bromoform	0.5-10	101	6.3	0.12
Bromomethane	0.5-10	95	8.2	0.11
n-Butylbenzene	0.5-10	100	7.6	0.11
sec-Butylbenzene	0.5-10	100	7.6	0.13
tert-Butylbenzene	0.5-10	102	7.3	0.14
Carbon tetrachloride	0.5-10	84	8.8	0.21
Chlorobenzene	0.1-10	98	5.9	0.04
Chloroethane	0.5-10	89	9.0	0.10
Chloroform	0.5-10	90	6.1	0.03
Chloromethane	0.5-10	93	8.9	0.13
2-Chlorotoluene	0.1-10	90	6.2	0.04
4-Chlorotoluene	0.1-10	99	8.3	0.06
Dibromochloromethane	0.1-10	92	7.0	0.05
1,2-Dibromo-3-chloropropane	0.5-10	83	19.9	0.26
1,2-Dibromoethane	0.5-10	102	3.9	0.06
Dibromomethane	0.5-10	100	5.6	0.24
1,2-Dichlorobenzene	0.1-10	93	6.2	0.03
1,3-Dichlorobenzene	0.5-10	99	6.9	0.12
1,4-Dichlorobenzene	0.2-20	103	6.4	0.03
Dichlorodifluoromethane	0.5-10	90	7.7	0.10
1,1-Dichloroethane	0.5-10	96	5.3	0.04
1,2-Dichloroethane	0.1-10	95	5.4	0.06
1,1-Dichloroethene	0.1-10	94	6.7	0.12
cis-1,2 Dichloroethene	0.5-10	101	6.7	0.12
trans-1,2-Dichloroethene	0.1-10	93	5.6	0.06
1,2-Dichloropropane	0.1-10	97	6.1	0.04
1,3-Dichloropropane	0.1-10	96	6.0	0.04
2,2-Dichloropropane	0.5-10	86	16.9	0.35
1,1-Dichloropropene	0.5-10	98	8.9	0.10
cis-1,2-Dichloropropene				
trans-1,2-Dichloropropene				
Ethylbenzene	0.1-10	99	8.6	0.06
Hexachlorobutadiene	0.5-10	100	6.8	0.11
Isopropylbenzene	0.5-10	101	7.6	0.15
4-Isopropyltoluene	0.1-10	99	6.7	0.12
Methylene chloride	0.1-10	95	5.3	0.03
Naphthalene	0.1-100	104	8.2	0.04
n-Propylbenzene	0.1-10	100	5.8	0.04
Styrene	0.1-100	102	7.2	0.04

TABLE 4. (Continued)

Compound	True Conc. Range (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit (µg/L)
1,1,1,2-Tetrachloroethane	0.5-10	90	6.8	0.05
1,1,2,2-Tetrachloroethane	0.1-10	91	6.3	0.04
Tetrachloroethene	0.5-10	89	6.8	0.14
Toluene	0.5-10	102	8.0	0.11
1,2,3-Trichlorobenzene	0.5-10	109	8.6	0.03
1,2,4-Trichlorobenzene	0.5-10	108	8.3	0.04
1,1,1-Trichloroethane	0.5-10	98	8.1	0.08
1,1,2-Trichloroethane	0.5-10	104	7.3	0.10
Trichloroethene	0.5-10	90	7.3	0.19
Trichlorofluoromethane	0.5-10	89	8.1	0.08
1,2,3-Trichloropropane	0.5-10	108	14.4	0.32
1,2,4-Trimethylbenzene	0.5-10	99	8.1	0.13
1,3,5-Trimethylbenzene	0.5-10	92	7.4	0.05
Vinyl chloride	0.5-10	98	6.7	0.17
o-Xylene	0.1-31	103	7.2	0.11
m-Xylene	0.1-10	97	6.5	0.05
p-Xylene	0.5-10	104	7.7	0.13

[a]Data obtained by Robert W. Slater using column 1 with a jet separator interface and a quadrupole mass spectrometer (Sect. 11.3.1) with analytes divided among three solutions.

TABLE 5. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING THE CRYOGENIC TRAPPING OPTION AND A NARROW BORE CAPILLARY COLUMN 3[a]

Compound	True Conc. (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit (µg/L)
Benzene	0.1	99	6.2	0.03
Bromobenzene	0.5	97	7.4	0.11
Bromochloromethane	0.5	97	5.8	0.07
Bromodichloromethane	0.1	100	4.6	0.03
Bromoform	0.1	99	5.4	0.20
Bromomethane	0.1	99	7.1	0.06
n-Butylbenzene	0.5	94	6.0	0.03
sec-Butylbenzene	0.5	90	7.1	0.12
tert-Butylbenzene	0.5	90	2.5	0.33
Carbon tetrachloride	0.1	92	6.8	0.08
Chlorobenzene	0.1	91	5.8	0.03
Chloroethane	0.1	100	5.8	0.02
Chloroform	0.1	95	3.2	0.02
Chloromethane	0.1	99	4.7	0.05
2-Chlorotoluene	0.1	99	4.6	0.05
4-Chlorotoluene	0.1	96	7.0	0.05
Cyanogen chloride[b]		92	10.6	0.30
Dibromochloromethane	0.1	99	5.6	0.07
1,2-Dibromo-3-chloropropane	0.1	92	10.0	0.05
1,2-Dibromoethane	0.1	97	5.6	0.02
Dibromomethane	0.1	93	6.9	0.03
1,2-Dichlorobenzene	0.1	97	3.5	0.05
1,3-Dichlorobenzene	0.1	99	6.0	0.05
1,4-Dichlorobenzene	0.1	93	5.7	0.04
Dichlorodifluoromethane	0.1	99	8.8	0.11
1,1-Dichloroethane	0.1	98	6.2	0.03
1,2-Dichloroethane	0.1	100	6.3	0.02
1,1-Dichloroethene	0.1	95	9.0	0.05
cis-1,2 Dichloroethene	0.1	100	3.7	0.06
trans-1,2-Dichloroethene	0.1	98	7.2	0.03
1,2-Dichloropropane	0.1	96	6.0	0.02
1,3-Dichloropropane	0.1	99	5.8	0.04
2,2-Dichloropropane	0.1	99	4.9	0.05
1,1-Dichloropropene	0.1	98	7.4	0.02
cis-1,3-Dichloropropene				
trans-1,3-Dichloropropene				
Ethylbenzene	0.1	99	5.2	0.03
Hexachlorobutadiene	0.1	100	6.7	0.04
Isopropylbenzene	0.5	98	6.4	0.10
4-Isopropyltoluene	0.5	87	13.0	0.26
Methylene chloride	0.5	97	13.0	0.09
Naphthalene	0.1	98	7.2	0.04

TABLE 5. (Continued)

Compound	True Conc. (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit (µg/L)
n-Propylbenzene	0.1	99	6.6	0.06
Styrene	0.1	96	19.0	0.06
1,1,1,2-Tetrachloroethane	0.1	100	4.7	0.04
1,1,2,2-Tetrachloroethane	0.5	100	12.0	0.20
Tetrachloroethene	0.1	96	5.0	0.05
Toluene	0.1	100	5.9	0.08
1,2,3-Trichlorobenzene	0.1	98	8.9	0.04
1,2,4-Trichlorobenzene	0.1	91	16.0	0.20
1,1,1-Trichloroethane	0.1	100	4.0	0.04
1,1,2-Trichloroethane	0.1	98	4.9	0.03
Trichloroethene	0.1	96	2.0	0.02
Trichlorofluoromethane	0.1	97	4.6	0.07
1,2,3-Trichloropropane	0.1	96	6.5	0.03
1,2,4-Trimethylbenzene	0.1	96	6.5	0.04
1,3,5-Trimethylbenzene	0.1	99	4.2	0.02
Vinyl chloride	0.1	96	0.2	0.04
o-Xylene	0.1	94	7.5	0.06
m-Xylene	0.1	94	4.6	0.03
p-Xylene	0.1	97	6.1	0.06

[a]Data obtained by Caroline A. Madding using column 3 with a cryogenic interface and a quadrupole mass spectrometer (Sect 11.3.3).
[b]Reference 8.

TABLE 6. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE CAPILLARY COLUMN 2[a]

Compound	No.[b]	Mean Accuracy (% of True Value, 2 µg/L Conc.)	RSD (%)	Mean Accuracy (% of True Value, 0.2 µg/L Conc.)	RSD (%)
Internal Standard					
Fluorobenzene	1	-	-	-	-
Surrogates					
4-Bromofluorobenzene	2	98	1.8	96	1.3
1,2-Dichlorobenzene-d_4	3	97	3.2	95	1.7
Target Analytes					
Benzene	37	97	4.4	113	1.8
Bromobenzene	38	102	3.0	101	1.9
Bromochloromethane	4	99	5.2	102	2.9
Bromodichloromethane	5	96	1.8	100	1.8
Bromoform	6	89	2.4	90	2.2
Bromomethane	7	55	27.	52	6.7
n-Butylbenzene	39	89	4.8	87	2.3
sec-Butylbenzene	40	102	3.5	100	2.8
tert-Butylbenzene	41	101	4.5	100	2.9
Carbon tetrachloride	8	84	3.2	92	2.6
Chlorobenzene	42	104	3.1	103	1.6
Chloroethane[c]					
Chloroform	9	97	2.0	95	2.1
Chloromethane	10	110	5.0	d	
2-Chlorotoluene	43	91	2.4	108	3.1
4-Chlorotoluene	44	89	2.0	108	4.4
Dibromochloromethane	11	95	2.7	100	3.0
1,2-Dibromo-3-chloropropane[c]					
1,2-Dibromoethane[c]					
Dibromomethane	13	99	2.1	95	2.2
1,2-Dichlorobenzene	45	93	2.7	94	5.1
1,3-Dichlorobenzene	46	100	4.0	87	2.3
1,4-Dichlorobenzene	47	98	4.1	94	2.8
Dichlorodifluoromethane	14	38	25.	d	
1,1-Dichloroethane	15	97	2.3	85	3.6
1,2-Dichloroethane	16	102	3.8	100	2.1
1,1-Dichloroethene	17	90	2.2	87	3.8
cis-1,2-Dichloroethene	18	100	3.4	89	2.9
trans-1,2-Dichloroethene	19	92	2.1	85	2.3

TABLE 6. (Continued)

Compound	No.[b]	Mean Accuracy (% of True Value, 2 µg/L Conc.)	RSD (%)	Mean Accuracy (% of True Value, 0.2 µg/L Conc.)	RSD (%)
1,2-Dichloropropane	20	102	2.2	103	2.9
1,3-Dichloropropane	21	92	3.7	93	3.2
2,2-Dichloropropane[c]					
1,1-Dichloropropene[c]					
cis-1,3-Dichloropropene[c]					
trans-1,3-Dichloropropene	25	96	1.7	99	2.1
Ethylbenzene	48	96	9.1	100	4.0
Hexachlorobutadiene	26	91	5.3	88	2.4
Isopropylbenzene	49	103	3.2	101	2.1
4-Isopropyltoluene	50	95	3.6	95	3.1
Methylene chloride	27	[e]		[e]	
Naphthalene	51	93	7.6	78	8.3
n-Propylbenzene	52	102	4.9	97	2.1
Styrene	53	95	4.4	104	3.1
1,1,1,2-Tetrachloroethane	28	99	2.7	95	3.8
1,1,2,2-Tetrachloroethane	29	101	4.6	84	3.6
Tetrachloroethene	30	97	4.5	92	3.3
Toluene	54	105	2.8	126	1.7
1,2,3-Trichlorobenzene	55	90	5.7	78	2.9
1,2,4-Trichlorobenzene	56	92	5.2	83	5.9
1,1,1-Trichloroethane	31	94	3.9	94	2.5
1,1,2-Trichloroethane	32	107	3.4	109	2.8
Trichloroethene	33	99	2.9	106	2.5
Trichlorofluoromethane	34	81	4.6	48	13.
1,2,3-Trichloropropane	35	97	3.9	91	2.8
1,2,4-Trimethylbenzene	57	93	3.1	106	2.2
1,3,5-Trimethylbenzene	58	88	2.4	97	3.2
Vinyl chloride	36	104	3.5	115	14.
o-Xylene	59	97	1.8	98	1.7
m-Xylene	60	[f]		[f]	
p-Xylene	61	98	2.3	103	1.4

[a]Data obtained by James W. Eichelberger using column 2 with the open split interface and an ion trap mass spectrometer (Sect. 11.3.2) with all method analytes in the same reagent water solution.
[b]Designation in Figures 1 and 2.
[c]Not measured; authentic standards were not available.
[d]Not found at 0.2 µg/L.
[e]Not measured; methylene chloride was in the laboratory reagent blank.
[f]m-xylene coelutes with and cannot be distinguished from its isomer p-xylene, No 61.

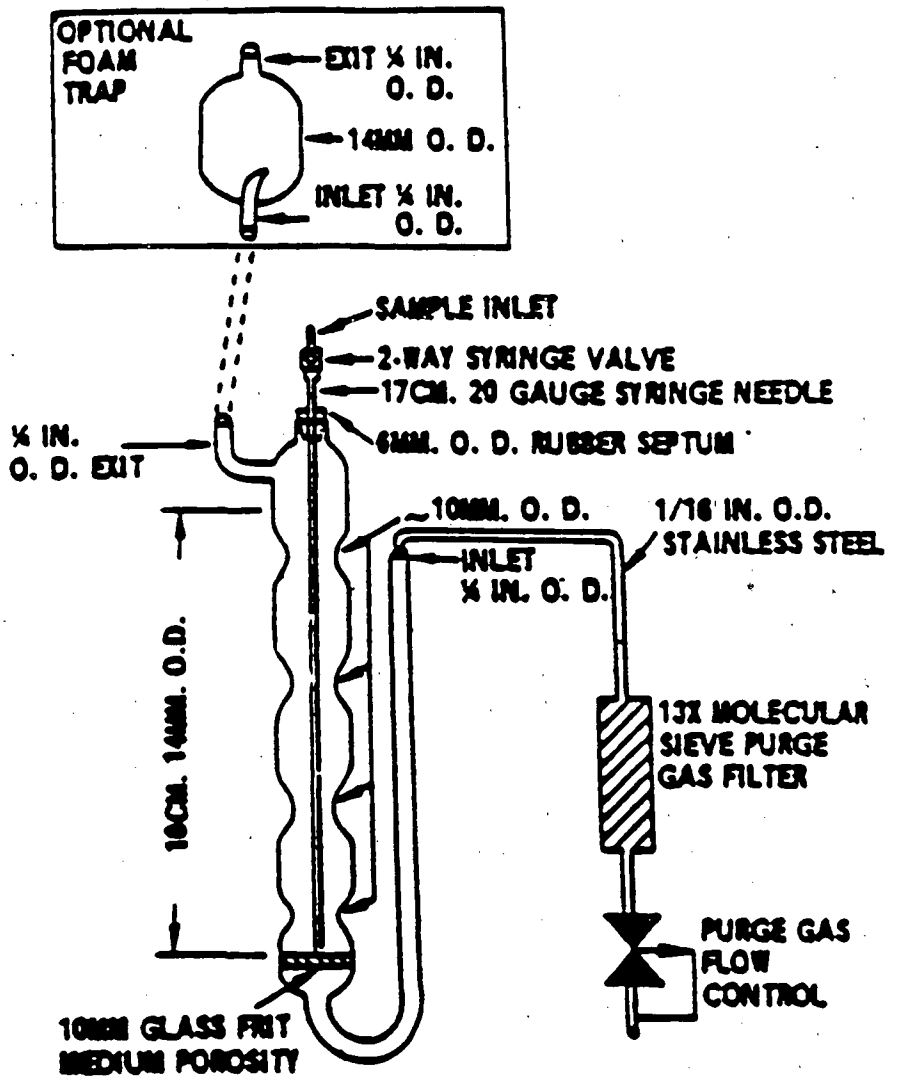


FIGURE 1. PURGING DEVICE

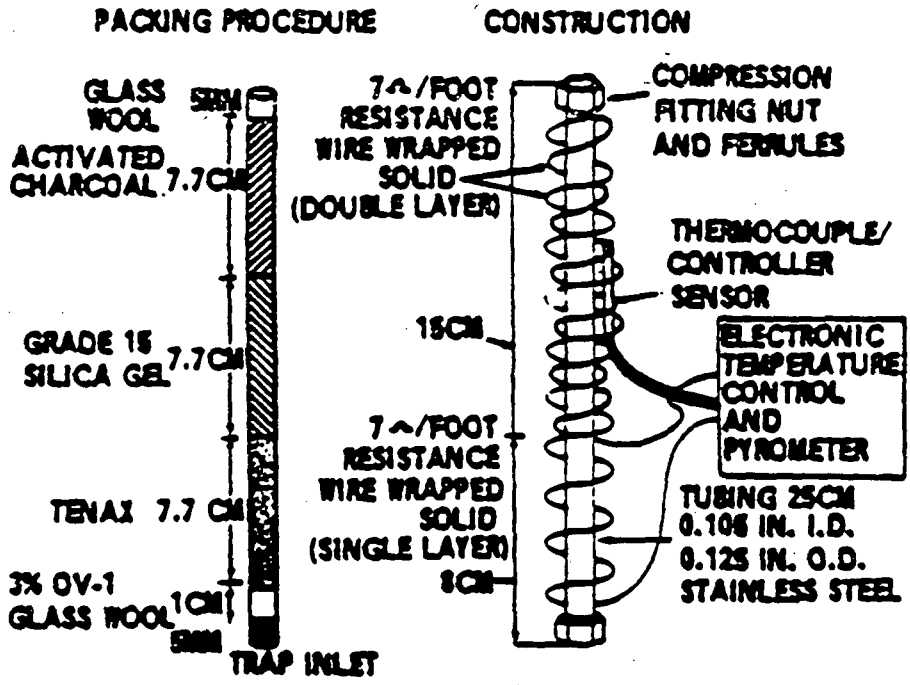


FIGURE 2. TRAP PACKINGS AND CONSTRUCTION TO INCLUDE DESORB CAPABILITY

FIGURE 3. NORMALIZED TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF MOST COMPOUNDS. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.

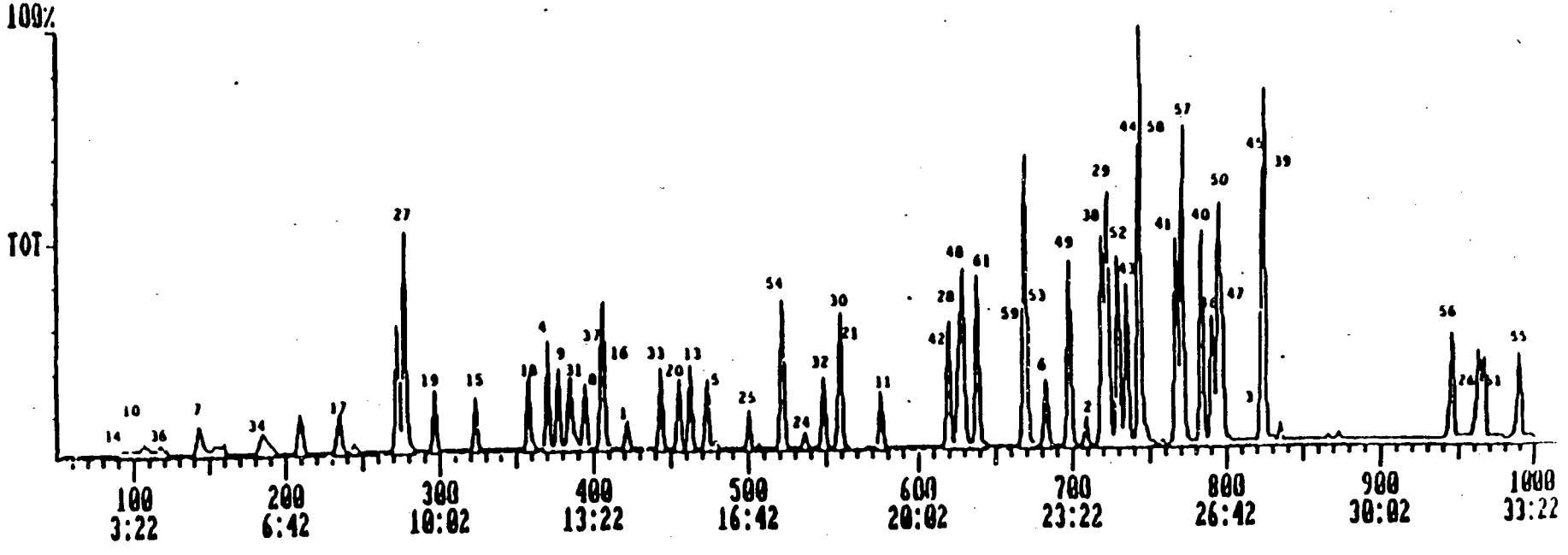
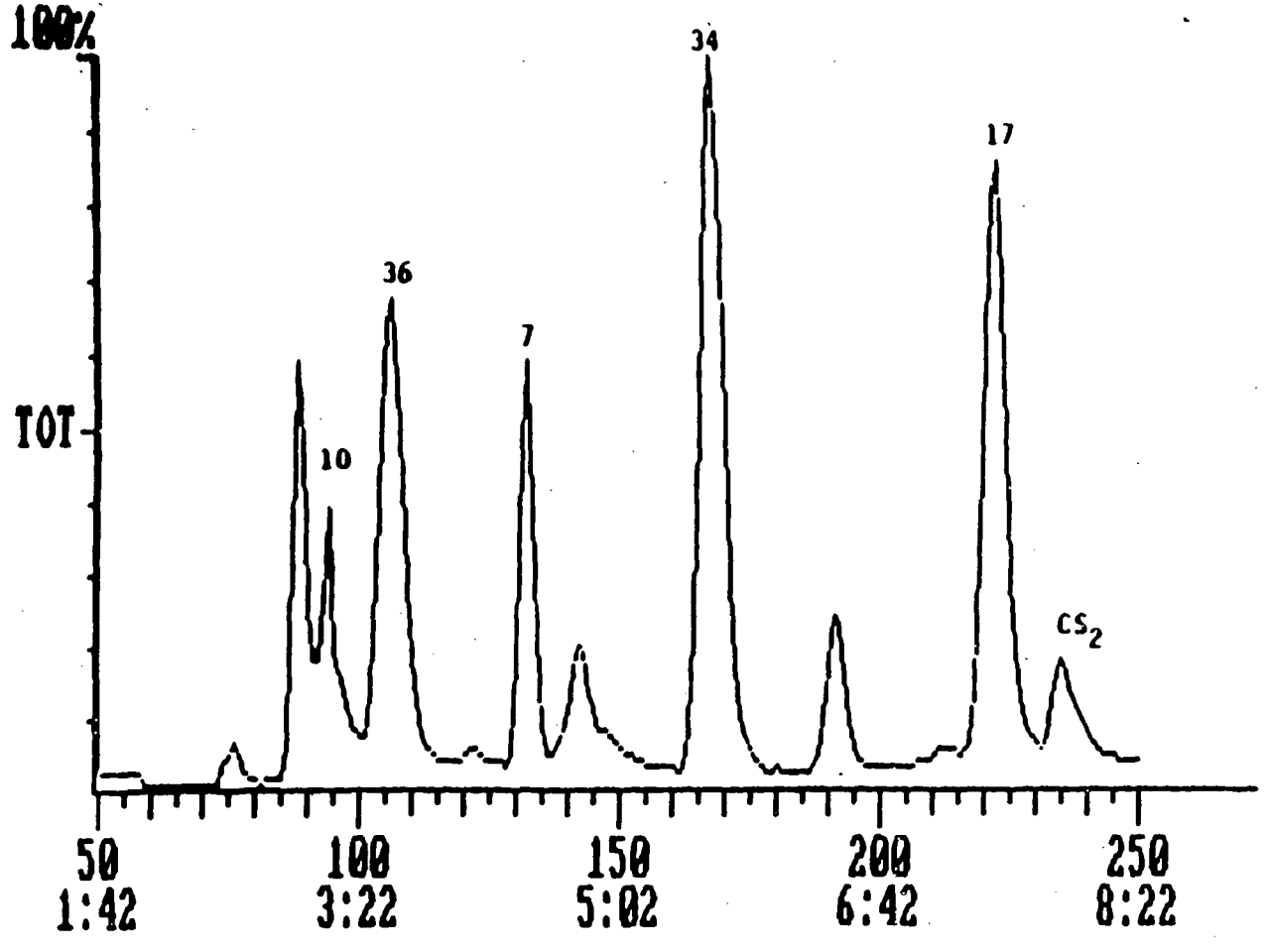


FIGURE 4. AMPLIFIED FIRST EIGHT MINUTES OF A TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF EACH COMPONENT. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.



APPENDIX C

CALIBRATION AND MAINTENANCE PROCEDURE FOR ANALYTICAL FIELD EQUIPMENT

CALIBRATION AND MAINTENANCE PROCEDURE
YSI MODEL 33 S-C-T METER

1.0 INTRODUCTION

This procedure presents steps to calibrate and maintain the YSI Model 33 S-C-T meter. Operation principles, procedures, and equipment specifications are presented in Procedure 5617002 and are not repeated here.

2.0 CALIBRATION

2.1 Temperature

2.1.1 Temperature Knob Setting

It is possible for the temperature knob to become loose or slip from its normal position. In an emergency, the dial can be repositioned. It must be emphasized that this is an emergency procedure only and that the instrument should be returned to the factory for proper recalibration - at the earliest opportunity.

To recalibrate the temperature setting:

1. Red line instrument and then place probe in sample of known conductivity.
2. Read and record the temperature and conductivity of the solution using appropriate settings. Leave probe in solution.
3. Determine the salinity of the solution by running a line vertically on Figure 1 until it intersects the appropriate 'C line. From this intersection, extend a line horizontally to the left edge of the graph (Figure 1). This determines the salinity of the sample.

6. Number of days analysis and data required after laboratory receipt of samples:

   21 days

7. Analytical protocol required (attach copy if other than a protocol currently used in this program:

   Inorganic analysis as per SOW 7/88, with the exceptions listed in Attachments II and III. ICP emission spectroscopy analysis follows the SOW mentioned above for sample preparation and analysis protocol with the instrument detection limits and matrix spike levels given in Attachment II and the QC audits as described in Attachment III. GFAA analyses may be run undigested if the samples are free of particulates. If particulates are present the samples are to be digested as per SOW mentioned above. A detailed set of instructions for conducting the GFAA analyses are included in Attachment III. Special instrument detection limits and matrix spike levels are listed on Attachment II.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): 1) Check the pH of each sample (wide range pH paper is acceptable). If the pH values are outside of the specified limits of SOW, contact Region V for instructions. 2) Instrument Detection limits (IDL) of Attachment II are to be met prior to any sample analysis. 3) Spike all parameters as per Attachment II.

   The GFAA protocol is specified in Attachment III. The frequency and limits of certain audits are changed from that given in SOW for all analyses as per Attachment III.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

   All of the deliverables included in SOW 7/88 or current SOW are required. Also, provide current quarterly XI, XII, XIII for each case. Submit Form VIII separate for each separate parameter analyzed by MSA. Form VIII must be modified to include the slope of each addition as well as the correlation coefficient. Use footnotes on Form I for reporting results, except use IDL of Attachment II for detection limit. Make changes on Forms V, VI, VII to reflect SAS contract limits and IDL where appropriate. All analytical results will be reported down to MDL, and flagged with "J".

10. Other (use additional sheets or attach supplementary information, as needed):

    _____

11. Name of sampling/shipping contact: Wendy Dewar/Robert Hank

    Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired (+% or Conc.)
ICP Metals (Cr)	See Attachment II	10% RPD or Duplicate
Furnace Metals (As, Pb, Cd)	See Attachment II	Differences < SAS IDL of - Attachment II

II. QC REQUIREMENTS

Audits Required	Frequency of Audits	Limits* (% or Conc.)
For ICP Chromium	See 9.A of Attachment III	
GFAA (undigested) As,Cd,Pb	See 9.B of Attachment III	
GFAA (digested) As,Cd,Pb	See 9.C of Attachment III	

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Take corrective action and repeat analysis

Contact Jay Thakkar at (312)886-1972

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

ATTACHMENT I

SCHEDULE

TENTATIVE START DATE: 6/4/90

SAMPLING FOR SOUTHEAST ROCKFORD

OPERABLE UNIT

WEEK	INVESTIGATIVE SAMPLES	FIELD BLANKS	FIELD DUPLICATE
1	77	8	8
2	78	9	9

NOTE: Samples will be shipped on a daily basis.

ATTACHMENT II

Instrument Detection Limit and Spiking Level for Drinking Water

	Compound	Required Instrument Detection Limit[1] ug/L			Required Matrix Spike Concentrations ug/L		
		GFAA	ICP	Other	GFAA	ICP	Other
	Metal:						
1.	Arsenic	5			20		
2.	Cadmium[2]	0.5			2	50	
3.	Chromium		10			200	
4.	Lead[2]	2			20	500	

[1] Instrument Detection Limits (IDL) must be met before any samples are analyzed. The Lab may submit their quarterly Form XI with each case if all IDLs meet the detection limits. If detection limits cannot be met by using ICP, use of GFAA required.

[2] ICP analysis results may only be reported for Cd and Pb, if the concentration is $\geq$ 10 times the IDL of instrument used. If ICP results are reported, all ICP audits are required including matrix spike.

ATTACHMENT III

Special Instruments for GFAA and QC Requirements for All Analysis

1. Sample aliquots are preserved in the field as follows:

   a) One liter preserved with 5ml/l of 50% HNO_3 to pH<2 for all metals (excluding Hg).

2. Analysis of the metals (specified in Attachment II) by graphite furnace atomic absorption (GFAA) must use the method of standard additions for quantitation.

3. All of the samples for GFAA metals can be analyzed without digestion if the samples are clean and without any particulates. In this case, a calibration blank, duplicate, ICVS, and CCVS shall be analyzed without digestion. If CCV is out, rerun previous to samples and CCV.

4. If any of the samples contain particulate or significant suspended solids, sample aliquots, preparation blank, duplicate, matrix spikes and lab control samples are to be digested per page D-2 of SOW.

5. No identified field blank may be used as a laboratory duplicate or matrix spike sample.

6.1 Zeeman, Smith/Hieftje background correction or equivalent (not D_2) is required for Arsenic or any element with structured background interferences.

6.2 The matrix modifiers of SOW 785 are mandatory for As.

6.3 L'vov platform is allowed.

6.4 Any matrix modifiers for Cd, and Pb must be approved by the Region V Central Regional Laboratory prior to use and documented with the raw data.

6.5 Each sample or QC audit is to be determined by the MSA using the sample or QC audit and then three consecutive spikes.

6.6 Each calibration blank and QC audit solution must contain the same nitric acid concentration as the sample (or diluted samples). All solutions analyzed must have their matrix concentrations fully documented in the raw data.

6.7 Each analytical determination must have the resulting absorbance clearly recorded and documented in the order of determined.

6.8 The data for each MSA determination must show; slope (signal/conc.), intercept and correlation coefficient (r). The results must be reported on Form VIII for all samples and QC audits in order of analysis. Form VIII must be modified to include the above mentioned slope.

6.9 Samples and QC audits will be tested in the following order for the method of standard addition quantitation.

a) calibration blank and + 3 spikes
b) ICVS (provided by EMSL-LV) + 3 spikes
c) 5 samples, each with 3 spikes
d) calibration blank + 3 spikes
e) CCVS + 3 spikes
f) succeeding sets of 5 samples, calibration blank, and CCVS.

7. Report the correlation coefficient for all MSA analyses. $r \geq 0.995$ is required for all sample and audit analyses. A correlation coefficient (r) ≥ 0.998 is recommended for the calibration blank or problems will occur with the sample analysis. If $r<0.995$ or the slope is <35% of the initial calibration blank, reanalyze the sample once. If the standard addition again fails these criteria, dilute the sample 1:1 or minimum dilution and reanalyze. If the standard addition again fails, flag the data with a "+".

8. Care must be taken to avoid exceeding the linear range for all GFAA analyses. This problem is especially severe with Cd and Pb. Dilution of the samples may be necessary to avoid this problem.

9. If sample concentration is higher than the highest spike added dilute sample 1:1 and reanalyze.

10. For MSA, use 10, 20, and 30 ug/l calibration standards and for Cadmium, use 1, 2 and 3 ug/l calibration standards for 3 spike addition.

ATTACHMENT III
QC REQUIREMENTS

9.A ICP Metals Audits Required	Frequency of Audits	Limits
ICVS, CCVS, ICP serial dilution, ICP ICS	as per SOW 7/88	as per SOW 7/88
Calibration Blank	beginning of run and 1 in 10 thereafter	≤ IDL
Preparation Blank	1 in 10 samples	≤ SAS IDL of Attachment II
Duplicate	1 in 10 samples	10% RPD or Difference is ≤ SAS IDL, 15% for Hg & CN
CRDL Standard (using SAS DL)	as per SOW 7/88	
Matrix Spike (ICP)	1 in 10 samples	85 - 115% Recovery
Matrix Spike (ICP-Ca, Mg, Na, K)*	1 in 10 samples	85 - 115% Recovery
Matrix Spike (Hg & CN)	1 in 10 samples	80 - 120%
Lab Control Sample (Digested)	1 per sample set	85 - 115%

*May be combined with other spike (cf Item 8 of SAS).

9.B GFAA Undigested Samples Audits Required	Frequency of Audits	Limits
1) Duplicate	1 in 10 samples	Difference of ≤ SAS IDL of Attachment II or ≤ 10% RPD
2) Calibration Blank	Initially and after every 5 samples	≤ IDL
3) ICVS and CCVS	Initially ICVS, and CCVS after every 5 samples	90% - 110%

ATTACHMENT III
QC REQUIREMENTS (Continued)

9.C	GFAA Digested Samples Audits Required	Frequency of Audits	Limits
	1) Calibration Blank	Initially and after every 5 samples	≤ IDL
	2) Preparation Blank (Digested)	1 in 10 samples	≤ SAS IDL of Attachment II
	3) Duplicates (Digested)	1 in 10 samples	Difference of ≤ SAS IDL or 10% RPD
	4) Matrix Spike	1 in 10 samples	85 - 115% Recovery
	5) Lab Control Sample (Digested)	1 per set of samples	85 - 115% Recovery
	6) ICVS, CCVS	Initially ICVS, and CCVS after every 5 samples	90 - 110% Recovery

U.S. Environmental Protection Agency
CLP Sample Management Office
P.O. Box 818, Alexandria, Virgina 22313
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES
Client Request

[x] Regional Transmittal [ ] Telephone Request

A. EPA Region/Client: Region V

B. RSCC Representative: Jan Pels

C. Telephone Number: (312) 353-2720

D. Date of Request: May 1990

E. Site Name: Southeast Rockford

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water for VOCs by EPA Method 524.2, Revision 3 for the 9 compounds listed in Attachment I. Samples that have an estimated total VOC concentration over 50 ug/l will be identified and labeled on the Traffic Report and sample tags and at the laboratories' option, may be screened using the CLP VOA optional screening method of hexadecane extract for volatiles of SOW 7/88. Estimates of VOC concentration range from 0-200 ug/l. If the concentration exceeds 50 ug/l run at 1 x and if necessary dilute so that the compound with the highest concentration falls within the calibration range. Report all reanalysis results at each dilution denoting dilution factors and the compounds that exceeded the calibration range. Results at each dilution, including non-diluted results, shall be submitted with the data package.

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

   144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates and 1 trip blank per cooler totaling 15. Samples will be collected over a 2 week period. Samples are water samples with total VOC concentration estimated to be in the 0-200 ug/l range.

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

   Superfund Remedial State Lead

4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment II)

5. Estimated date(s) and method of shipment: June 4 to June 16, 1990 - Overnight Express Service.

6. Number of days analysis and data required after laboratory receipt of samples:

   Analysis within 5 days of sample receipt. Full data package due within 21 days.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

   Method 524.2, Revision 3 (Attachment III). The accuracy and precision range required for sample analysis is 0.5 to 50 ug/l. A study of the accuracy and precision over the range of 0.5 to 50 ug/l shall be completed by the lab and the results must be submitted with the data. The accuracy and precision of the lab control standard, which can be one of the standards used for calibration, shall be ± 20 percent. Wide-bore, thick-film columns will be used for analysis. Five calibration standards composed of 8 of the 9 compounds listed in Attachment I (cis-1,2-dichloroethylene will be used for calibration but not trans-1,2-dichloroethylene) will be used to obtain calibration over a 0.5 to 50 ug/l range. The GC/MS will be calibrated for only the 9 compounds of concern (Attachment I). For each calibration standard the relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units. The lab can choose the appropriate calibration standard concentrations in order to obtain calibration over the 0.5 to 50 ug/l range. The optional vinyl chloride calibration procedure from Section 9.4 of Method 524.2, Revision 3 will be used. The %RSD for each individual calibration compound must be less than or equal to 30.0 percent.
   The continuing calibration check standard shall contain all nine (9) target compounds. If percent difference of any compound of the continuing calibration check standard is greater than 25%, then corrective action shall be taken. The minimum relative response factor (RF) for each target compound shall be greater than 0.150.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): Complete resolution of cis-1,2-dichloroethylene and trans-1,2-dichloroethylene is required with cis-1,2-dichloroethylene used for calibration. Surrogates and matrix spikes appropriate for each method must be performed. Perform surrogate spike analysis described in Method 524.2, Revision 3, Section 10.3.3 and 7.5.1 with BFB as the surrogate at a concentration of 5 ug/l. The internal standard shall consist of fluorobenzene at a concentration of 5 ug/l. The matrix spike (MS) standard shall consist of all 9 target compounds. The MS Standard specified in CLP SOW shall NOT be used. One quality control standard from an external source must be analyzed per laboratory. The external quality control standard will at minimum contain the 9 contaminants of concern. The results must be submitted with the data. Standard and surrogate compounds must be supplied by the laboratory.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

   Complete EPA CLP type data package including but not limited: narrative, QC Summary, chromatograms, integration reports, all standard and spiking concentrations, injection volumes, dilution factors, analytical sequence summary, calculation, dates and times. Only the 9 target compounds, if detected, shall be reported, all other volatile organics shall NOT be reported. All analytical results will be reported down to MDL, and flagged with "J".

10. Other (use additional sheets or attach supplementary information, as needed):

    After samples that contain a total VOC concentration of greater than 50 ug/l are analyzed a lab reagent blank must be analyzed to check for cross contamination. Samples that require ascorbic acid addition for dechlorination will be labeled. All other samples require no preservation except for cooling to 4°C.

11. Name of sampling/shipping contact: Robert Hank/Wendy Dewar

    Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired (+% or Conc.)
See Attachment I		

II. QC AUDIT REQUIREMENTS

Audits Required	Frequency of Audits	Limits* (% or Conc.)
Surrogate Spiking	All Samples, Stds. Blanks	± 15%
Duplicate Analysis	1 per 10	20% RPD for compounds present at more than 10x MDL
Lab Reagent Blank	1 per 10*	Less than Method Detection Limit
Matrix Spike/Matrix Spike Duplicate**	1 per 25 or per lab	80-120% recovery, 20% RPD
QC Check Sample***	Once each time 5 pt. calibration curve is generated.	±20% @ 5 ug/l for 7 out of 8 compounds. TCE must be in control.

*A field blank may not be substituted.
**Matrix Spike/Matrix Spike Duplicate must be composed of the compounds being analyzed.
***All target compounds except vinyl chloride must be in this sample.

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

If surrogate spike recovery is greater than ±15%, reanalyze once. If recovery is again greater than ±15% report data as estimated. If duplicate is greater than 20 RPD for required compounds, repeat once and report results. If matrix spike does not meet limits do not repeat, report results, flag data.

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

ATTACHMENT I

COMPOUND	METHOD DETECTION LIMIT (ug/l)
Trichloroethylene	0.50
1,1,1 Trichloroethane	0.50
1,1-Dichloroethylene	0.50
Tetrachloroethylene	0.50
1,2-Dichloroethane	0.50
1,1-Dichloroethane	0.50
Vinyl Chloride	0.50
Cis-1,2-Dichloroethylene	0.50
Trans-1,2-Dichloroethylene	0.50

ATTACHMENT II
SCHEDULE
TENTATIVE START DATE: 6/4/90
SAMPLING FOR SOUTHEAST ROCKFORD
OPERABLE UNIT

WEEK	INVESTIGATIVE SAMPLES	FIELD BLANKS	FIELD DUPLICATE	TRIP BLANK
1	77	8	8	7
2	78	9	9	8

NOTE: Samples will be shipped on a daily basis.

ATTACHMENT III
METHOD 524.2

METHOD 524.2. MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY

Revision 3.0

A. Alford-Stevens, J. W. Eichelberger, W. L. Budde - Method 524, Revision 1.0 (1983)

R. W. Slater, Jr. - Method 524.2, Revision 2.0 (1986)

J. W. Eichelberger, W. L. Budde - Method 524.2, Revision 3.0 (1989)

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

METHOD 524.2

MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY

1. SCOPE AND APPLICATION

1.1 This is a general purpose method for the identification and simultaneous measurement of purgeable volatile organic compounds in finished drinking water, raw source water, or drinking water in any treatment stage (1-2). The method is applicable to a wide range of organic compounds, including the four trihalomethane disinfection by-products, that have sufficiently high volatility and low water solubility to be efficiently removed from water samples with purge and trap procedures. The following compounds can be determined by this method.

Compound	Chemical Abstract Service Registry Number
Benzene	71-43-2
Bromobenzene	108-86-1
Bromochloromethane	74-97-5
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
n-Butylbenzene	104-51-8
sec-Butylbenzene	135-98-8
tert-Butylbenzene	98-06-6
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane	74-87-3
2-Chlorotoluene	95-49-8
4-Chlorotoluene	106-43-4
Dibromochloromethane	124-48-1
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane	106-93-4
Dibromomethane	74-95-3
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-4
trans-1,2-Dichloroethene	156-60-5
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9

2,2-Dichloropropane	590-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
Hexachlorobutadiene	87-68-3
Isopropylbenzene	98-82-8
4-Isopropyltoluene	99-87-6
Methylene chloride	75-09-2
Naphthalene	91-20-3
n-Propylbenzene	103-65-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-3
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl chloride	75-01-4
o-Xylene	95-47-6
m-Xylene	108-38-3
p-Xylene	106-42-3

1.2 Method detection limits (MDLs) (3) are compound and instrument dependent and vary from approximately 0.02-0.35 µg/L. The applicable concentration range of this method is primarily column dependent and is approximately 0.02 to 200 µg/L for the wide-bore thick-film columns. Narrow-bore thin-film columns may have a capacity which limits the range to about 0.02 to 20 µg/L. Analytes that are inefficiently purged from water will not be detected when present at low concentrations, but they can be measured with acceptable accuracy and precision when present in sufficient amounts.

1.3 Analytes that are not separated chromatographically, but which have different mass spectra and non-interfering quantitation ions, can be identified and measured in the same calibration mixture or water sample (Sect 11.6.2). Analytes which have very similar mass spectra cannot be individually identified and measured in the same calibration mixture or water sample unless they have different retention times (Sect.11.6.3). Coeluting compounds with very similar mass spectra, typically many structural isomers, must be reported as an isomeric group or pair. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary column, and if not, must be reported as isomeric pairs.

2. SUMMARY OF METHOD

2.1 Volatile organic compounds and surrogates with low water solubility are extracted (purged) from the sample matrix by bubbling an inert gas through the aqueous sample. Purged sample components are trapped in a tube containing suitable sorbent materials. When purging is complete, the sorbent tube is heated and backflushed with helium to desorb the trapped sample components into a capillary gas chromatography (GC) column interfaced to a mass spectrometer (MS). The column is temperature programmed to separate the method analytes which are then detected with the MS. Compounds eluting from the GC column are identified by comparing their measured mass spectra and retention times to reference spectra and retention times in a data base. Reference spectra and retention times for analytes are obtained by the measurement of calibration standards under the same conditions used for samples. The concentration of each identified component is measured by relating the MS response of the quantitation ion produced by that compound to the MS response of the quantitation ion produced by a compound that is used as an internal standard. Surrogate analytes, whose concentrations are known in every sample, are measured with the same internal standard calibration procedure.

3. DEFINITIONS

3.1 Internal standard -- A pure analyte(s) added to a solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same solution. The internal standard must be an analyte that is not a sample component.

3.2 Surrogate analyte -- A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction and is measured with the same procedures used to measure other sample components. The purpose of a surrogate analyte is to monitor method performance with each sample.

3.3 Laboratory duplicates (LD1 and LD2) -- Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

3.4 Field duplicates (FD1 and FD2) -- Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

3.5 Laboratory reagent blank (LRB) -- An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method

analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

3.6 Field reagent blank (FRB) -- Reagent water placed in a sample container in the laboratory and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

3.7 Laboratory performance check solution (LPC) -- A solution of one or more compounds (analytes, surrogates, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

3.8 Laboratory fortified blank (LFB) -- An aliquot of reagent water to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements at the required method detection limit.

3.9 Laboratory fortified sample matrix (LFM) -- An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations.

3.10 Stock standard solution -- A concentrated solution containing a single certified standard that is a method analyte, or a concentrated solution of a single analyte prepared in the laboratory with an assayed reference compound. Stock standard solutions are used to prepare primary dilution standards.

3.11 Primary dilution standard solution -- A solution of several analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.

3.12 Calibration standard (CAL) -- a solution prepared from the primary dilution standard solution and stock standard solutions of the internal standards and surrogate analytes. The CAL solutions are used to calibrate the instrument response with respect to analyte concentration.

3.13 Quality control sample (QCS) -- a sample matrix containing method analytes or a solution of method analytes in a water miscible solvent which is used to fortify reagent water or environmental samples. The QCS is obtained from a source external to the laboratory, and is used

to check laboratory performance with externally prepared test materials.

4. INTERFERENCES

4.1 During analysis, major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) plastic tubing, non-PTFE thread sealants, or flow controllers with rubber components in the purging device should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of laboratory reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in laboratory reagent blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter. Subtracting blank values from sample results is not permitted.

4.2 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing relatively high concentrations of volatile organic compounds. A preventive technique is between-sample rinsing of the purging apparatus and sample syringes with two portions of reagent water. After analysis of a sample containing high concentrations of volatile organic compounds, one or more laboratory reagent blanks should be analyzed to check for cross contamination.

4.3 Special precautions must be taken to determine methylene chloride. The analytical and sample storage area should be isolated from all atmospheric sources of methylene chloride, otherwise random background levels will result. Since methylene chloride will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing should be constructed of stainless steel or copper tubing. Laboratory worker's clothing should be cleaned frequently since clothing previously exposed to methylene chloride fumes during common liquid/liquid extraction procedures can contribute to sample contamination.

5. SAFETY

5.1 The toxicity or carcinogenicity of chemicals used in this method has not been precisely defined; each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. Each laboratory is responsible for maintaining awareness of OSHA regulations regarding safe handling of chemicals used in this method. Additional references to laboratory safety are available (4-6) for the information of the analyst.

5.2 The following method analytes have been tentatively classified as known or suspected human or mammalian carcinogens: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichloroethane, hexachlorobutadiene 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chloro-

form, 1,2-dibromoethane,tetrachloroethene, trichloroethene, and vinyl chloride. Pure standard materials and stock standard solutions of these compounds should be handled in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

6. APPARATUS AND EQUIPMENT

6.1 SAMPLE CONTAINERS -- 60-mL to 120-mL screw cap vials (Pierce #19832 or equivalent) each equipped with a PTFE-faced silicone septum (Pierce #12718 or equivalent). Prior to use, wash vials and septa with detergent and rinse with tap and distilled water. Allow the vials and septa to air dry at room temperature, place in a 105°C oven for 1 hr, then remove and allow to cool in an area known to be free of organics.

6.2 PURGE AND TRAP SYSTEM -- The purge and trap system consists of three separate pieces of equipment: purging device, trap, and desorber. Systems are commercially available from several sources that meet all of the following specifications.

6.2.1 The all glass purging device (Figure 1) should be designed to accept 25-mL samples with a water column at least 5 cm deep. A smaller (5-mL) purging device is recommended if the GC/MS system has adequate sensitivity to obtain the method detection limits required. Gaseous volumes above the sample must be kept to a minimum (< 15 mL) to eliminate dead volume effects. A glass frit should be installed at the base of the sample chamber so the purge gas passes through the water column as finely divided bubbles with a diameter of < 3 mm at the origin. Needle spargers may be used, however, the purge gas must be introduced at a point about 5 mm from the base of the water column.

6.2.2 The trap (Figure 2) must be at least 25 cm long and have an inside diameter of at least 0.105 in. Starting from the inlet, the trap should contain 1.0 cm of methyl silicone coated packing and the following amounts of adsorbents: 1/3 of 2,6-diphenylene oxide polymer, 1/3 of silica gel, and 1/3 of coconut charcoal. If it is not necessary to determine dichlorodifluoromethane, the charcoal can be eliminated and the polymer increased to fill 2/3 of the trap. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Vent the trap effluent to the room, not to the analytical column. Prior to daily use, the trap should be conditioned for 10 min at 180°C with backflushing. The trap may be vented to the analytical column during daily conditioning; however, the column must be run through the temperature program prior to analysis of samples.

6.2.3 The use of the methyl silicone coated packing is recommended, but not mandatory. The packing serves a dual purpose of protecting the Tenax adsorbant from aerosols, and also of

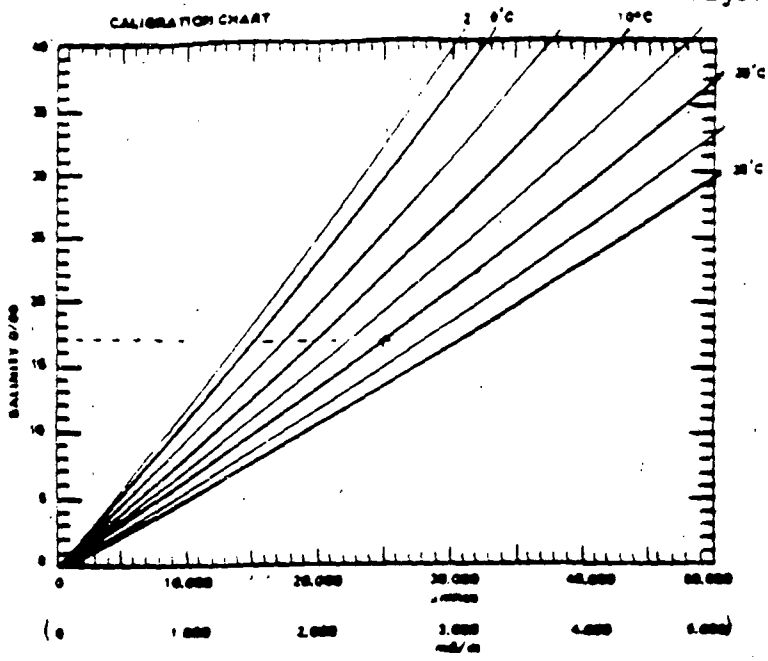


Figure 1. Calibration Chart for Resetting Temperature Knob

4. Remove the °C knob switch to SALINITY, and turn the control shaft until the meter needle indicates the salinity value determined in step 3.

5. Switch to TEMPERATURE. If this temperature is the same as step 2, continue. If not, repeat steps 1 through 5.

6. Place the knob on the control shaft - without turning the control shaft - with the pointer at the same temperature as the meter reading. Tighten both sets of screws securely. Care must be taken at this step so that the shaft setting is not moved.

7. Return the instrument to the factory at the earliest opportunity.

2.1.2 Tempertaure Probe/Instrument

To check the accuracy of the Probe/Instrument temperature readings:

1. Place NBS traceable thermometer in solution with thermometer and probe.

2. Place instrument in temperature mode after zeroing and red lining the instrument.

3. After five minutes, compare temperature of thermometer and instrument. If the instrument varies by ±1C, the instrument should be returned to the factory for calibration and maintenance.

2.2 Probe Cell Calibration

The YSI #3300 Series Cells are calibrated to absolute accuracy of ± 1.5 percent based on a standard solution of 0.01 demol KCl. To prepare this solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.

2. Use Table 1 and the temperature of the water to determine the conductivity of the solution just prepared. Note: Table 1 shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.

3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by ± 1.5%. If the reading is greater than 1.5%, clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solution within ± 1.5%, the probe and instrument should be returned to the manufacturer for calibration and maintenance.

3.0 MAINTENANCE

3.1 Batteries

The batteries should be replaced either (1) when it is not possible to red line the instrument, (2) after 200 hours of operation, or (3) every 6 months to reduce the danger of corrosion due to leaky batteries.

To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The positive (+ button) end must go on red.

Use two "D" size alkaline flashlight cells (Eveready E95 or equivalent).

3.2 Probe

3.2.1 Cleaning

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

TABLE 1 - CELL CALIBRATION DATA

Temperature (°C)	Conductivity (umhos/cm)
15	1141.5
16	1167.5
17	1193.6
18	1219.9
19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaner such as: "Rally, Tile, Porcelain, and Chrome Cleaner"; Johnson Wax "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner".

For storage cleaning, a 5 minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe in distilled water after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is very soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

3.2.2 Probe Replatinizing

1. Equipment required:
   a. YSI #3140 Platinizing Solution, 2 fluid ounce (3% platinum chloride dissolved in 0.025% lead acetate solution)
   b. YSI Model 33 meter
   c. 50 ml glass beaker or equivalent
   d. Distilled water
2. Procedure
   a. Clean probe as in section 3.2.1 - either method

b. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe

c. Plug the probe into the Model 33 and switch to the X100 scale to platinize the electrode

d. Move the probe slightly to obtain the highest meter reading and continue platinizing for the appropriate time shown below:

Meter Reading (umhos/cm)	Time (minutes)
30,000	5
25,000	6
20,000	8
15,000	11
10,000	16

e. After the elapsed time, remove the probe and rinse in distilled water.

f. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

3.2.3 Storage

It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

CALIBRATION AND MAINTENANCE PROCEDURES HAAKEBUCHLER pH STICK

1.0 INTRODUCTION

This procedure presents the steps for calibrating and maintaining the HaakeBuchler pH Stick. Instrument operation principles and procedures and specifications are presented in Procedure 5617003.

2.0 CALIBRATION

2.1 Calibration Solutions

The instrument requires distilled water, a pH 7 buffer solution, and a pH 4 buffer solution for calibration. To prepare the buffer solutions, dissolve the buffer powders provided with the instrument into the volume of distilled water specified on the buffer powder packets. (Note: the manufacturer does not specify whether buffer and pH 4 solutions, other than that provided, may be used as substitute solutions).

The pH of the buffer and pH 4 solutions will vary with the temperature of the solution. Use the table below to determine solution pH based on temperature.

Temp	0°C	10°C	20°C	25°C	30°C	40°C	50°C
pH 4	4.00	4.00	4.00	4.01	4.02	4.04	4.06
pH 7	7.11	7.06	7.01	7.00	6.98	6.97	6.97

2.2 Calibration Procedure

The instrument requires calibration in the field prior to each use. However, as a check of proper instrument function, the instrument should be periodically calibrated in the laboratory,

particularly if the instrument has been stored for an extended period without use.

To calibrate the instrument:

1. Remove the protective sheath and rinse the electrode in distilled water.
2. Place the electrode in the pH 7 buffer solution, depress the white operation button below the LCD display and allow the reading to stabilize.
3. Adjust pH 7 control using the tool on the end of the protective sheath. The pH 7 control is the upper most white control on the right side of the instrument. Adjust the pH control until the meter reads pH 7.
4. Rinse the electrode in distilled water.
5. Place the electrode in pH 4 solution, depress the white operation button, and allow the reading to stabilize.
6. Adjust the slope control (white control below pH 7 control on the right side of the instrument) until the meter reads the correct value of the pH 4 solution.
7. Rinse the probe in distilled water.
8. Repeat steps 2 through 7.
9. Record calibration on the instrument log form.
10. Store instrument properly.

3.0 MAINTENANCE

3.1 Storage

To maintain high accuracy and to obtain a long electrode life, the pH stick must be stored correctly when not in use. Always rinse the electrode in distilled water before replacing it in its protective sheath. The electrode must not be let to dry out.

The absorbent pad at the bottom of the sheath must be kept saturated with a pH 7 buffer solution. If this is not available, distilled water can be used as a temporary measure. Replace distilled water with buffer solution at the earliest possible opportunity. Always place buffer (or distilled water) into sheath following each use.

To retain accuracy and speed of response, the insulation of the connectors on the electrode and the body must be kept clean and dry. This is best assured by not unnecessarily removing the electrode from the body.

When not in use, place the pH stick in the wallet provided and store in a dry place.

3.2 Electrode Cleaning

If rinsing the electrode in distilled water is not deemed sufficient to clean the electrode, it can be cleaned in a N/10 HCl acid solution. Following cleaning in the acid, the electrode should be soaked in a pH 7 buffer solution for 24 hours before rinsing. Record cleaning on instrument's log form.

3.3 Battery

Normal battery life is in excess of 200 hours of continuous use. Cells should be replaced at 2 year intervals or earlier if exhausted (voltage per cell of less than 1.35V). Replacement cells must be mercury type V312H or direct equivalent. When refitting cells, make sure they are refitted in the manner illustrated on the battery housing.

EQUIPMENT AND INSTRUMENT CALIBRATION AND MAINTENANCE, GENERAL REQUIREMENTS

1.0 INTRODUCTION

The general guidelines for calibrating and maintaining instruments and monitoring equipment are presented in this document.

2.0 CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures are documented for each piece of equipment affecting quality. Calibration and maintenance procedures are developed based on manufacturer's specifications and are retained in the Site Investigation Procedures Manual. These procedures include, but are not limited to:

1. Equipment identification (name) and description.
2. Equipment specifications.
3. Calibration and/or maintenance schedule.
4. Equipment necessary to accomplish calibration (where applicable).
5. Procedure for calibration and/or maintenance.

3.0 CALIBRATION LABEL

Instruments requiring calibration and/or maintenance have a prominently displayed sticker containing the following information:

1. Date of calibration and/or maintenance.
2. Next due date for calibration and/or maintenance.
3. Initials of person performing calibration and/or maintenance.
4. Span gas and concentration(s) (if applicable).
5. Span or sensitivity setting (if applicable).

4.0 EQUIPMENT LOG BOOK

An equipment log book is issued to record the life history of each measuring and testing device used in activities affecting quality. This book is a three ring binder in which individual records for each piece of equipment are maintained. A form such as F6101 or a reasonable facsimile should be used to maintain the calibration and maintenance record. The record should include:

1. Equipment identification (name) and control number.
2. Date of calibration and/or maintenance.
3. Condition of equipment.
4. Activity performed on instrument (calibration and/or maintenance).
5. Adjustments made and accuracy of equipment prior to and following calibration (where applicable).
6. Record of equipment failure or inability to meet specifications (where applicable).
7. Initials of person performing calibration/maintenance.
8. Next due date for calibration and/or maintenance.

5.0 CALIBRATION/MAINTENANCE FORM

An instrument specific calibration/maintenance form will be developed to record data relating to each individual calibration/maintenance event. A single form will be used for each calibration/maintenance event. In addition to the data recorded in the calibration/maintenance log, the following items should also be included in the instrument specific form (where applicable).

1. Calibration calculations and curves.
2. Span gas type and concentrations.
3. Span or sensitivity range settings.
4. Specifics on repairs and parts replaced, added, or removed.

5. Instrument's overall condition.

6.0 FIELD CALIBRATION

As part of normal field operations, some instruments require calibration prior to, during, and/or after field use. This field operation calibration should remain separate from pre-field calibrations and should not be used as a substitute for standard calibration activities. Field calibration should be recorded in field log books or on field forms as part of the normal field data collection process. Field calibration records should not be included in the history log.

7.0 INSTRUMENTS NOT IN COMPLIANCE

If the calibration schedule is not adequately maintained, or if accuracy as reported in specifications cannot be attained for a specific instrument, that instrument is labelled "HOLD" and is unavailable for use until it is repaired and specifications are attained.

APPENDIX D

IEPA SAMPLE BOTTLE SUPPLY SERVICE

SECTION B

SAMPLE CONTAINER AND COMPONENT SPECIFICATIONS

SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

Figure B-1 following, designates the specifications for the eight types of containers and the associated materials (i.e., teflon liners, lids, etc.) to be supplied by the Contractor under this contract.

All materials received from vendors shall be subjected to incoming inspection by the Contractor to insure conformance with these established specifications. Variations in materials shall be considered unacceptable. Any materials not in conformance with these specifications shall be returned by the Contractor to the vendor for replacement.

FIGURE B-1

Container Type	Container and Material Specification	Parameter and Sample Type
1	Container: 1 liter* amber, Boston round, glass bottle, 33 mm pour-out neck finish Closure: white polypropylene cap, 33-400 size, .015 mm teflon liner	Extractable Organics
3	Container: 1 liter* natural high-density polyethylene cylinder round bottle, 52g weight, 28 mm neck finish. Closure: baked polyethylene, white ribbed, 28-400 or 28-410 size; unlined lid.	Metals, Cyanide Radioactivity, General, Nutrients, Sulfide
5	Container: 32 oz. tall, wide-mouth straight-sided paragon, flint glass jar, 89 mm neck finish. Closure: white polypropylene cap, 89-400 size, .015 mm teflon liner	Extractable Organics, Oil/ Grease, Metals, Mercury, Cyanide, Nutrients, Phenols, General, Sulfide
7	Container: 8 oz. wide-mouth glass jar	Same as type 5
8	Container: 40 ml borosilicate glass vial, Type 1 glass, 24 mm neck finish. Closure: black phenolic, open-top, screw cap, 15 cm opening, 24-400 size. Septum: 22 mm disc of 2 mil teflon bonded to silicon for total thickness of 125 mil.	THM/VOA
9	Container: 1/2 gallon amber glass, ring handle bottle/jug, 38 mm neck finish. Closure: teflon-lined white propylene cap, 38-400 size.	Extractable Organics

10	Container: 500 ml natural high density polyethylene, oblong bottle, 43 mm neck finish. Closure: white propylene unlined cap, 43-400 size (or 43 mm).	Mercury
11	1 gallon plastic	Prefiltration
12	Container: 2 oz., wide-mouth straight-sided paragon, flint glass jar, 53 mm neck closure: white polypropylene cap, 53-400 size, 0.015 mm teflon liner.	THM/VOA

* These bottles must have sufficient overfill to accommodate an actual capacity of 1 liter of liquid. Bottle manufacturers refer to these bottles as 32 ounce bottles, however all 32 ounce bottles do not have sufficient overfill to meet the requirement.

NOTE: Containers and component material specifications different than, but equivalent to, the manufacturer's specifications cited herein may be acceptable. The bidder shall be required to demonstrate equivalence prior to Government approval of use of alternate materials. The Government shall determine acceptability as part of bidder preaward confirmations (see Pre-Award Bid Confirmations).

Exhibit A

SECTION C

CONTAINERS PREPARATION AND CLEANING PROCEDURES

CONTAINER PREPARATION AND CLEANING PROCEDURES

The Contractor shall clean and prepare containers and component materials according to the following procedures specified for each container type.

I. Extractable Organics

Container Types: 1 - 1 liter amber glass
5 - 32 oz glass jar
9 - 1/2 gallon amber glass
7 - 8 oz glass jar

1. The containers, teflon liners and caps are to be washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Dry in oven @ 125°C for one hour.
5. Rinse inside and outside of container with pesticide hexane.
6. Dry containers, liners, and caps in an oven at 125°C for one hour.
7. Allow containers to cool and seal with teflon lined caps.
8. Label each container with color coded labels, with lot number, and pack in a sealable carton.
9. Place identical labels on exterior of carton and store in a designated contaminant-free area.

II. Purgeable Organics:

Container Types: 8 - 40 ml glass vial
12 - 2 oz. glass jar

1. Containers, teflon-backed septa and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Oven dry vials, containers, caps, septa, and teflon-lined lids at 125°C for one hour.

5. Cool in a contaminant-free area.

6. Seal vials with septa (teflon side down) and cap. Seal containers with cap and liner.

7. Label each vial and container with color coded label with lot number, and pack in a carton and seal.

8. Place identical label on outside of carton with respective lot number and store in a contaminant-free area.

III. Metals, Mercury, Cyanide, Radioactivity

Container Types: 3 - 1L high-density Polyethylene
5 - 32 oz glass jar
10 - 250 ml high-density Polyethylene
7 - 8 oz glass jar

1. The bottles and caps are washed in tap water with laboratory grade non-phosphate detergent.

2. Rinse with 50% reagent grade HNO3.

3. Rinse three times with ASTM Type I deionized water.

4. Invert and dry in a contaminant-free area.

5. Cap each container, label with color coded label with lot number and place in a carton.

6. Label carton with the same lot number and store in a contaminant-free area.

IV. Phenols, Nutrients, General, Pre-filtration, Sulfide

Container Types: 3 - 1L high-density Polyethylene
5 - 32 oz glass jar
11 - 1 gallon plastic
7 - 8 oz glass jar

1. Wash containers in tap water with laboratory-grade non-phosphate detergent. Wash caps in a separate wash.

2. Rinse three times with tap water.

3. Rinse three times with ASTM Type I deionized water.

4. Invert bottles and dry in a contaminant-free area.

3. Cap bottles and label with color coded label with lot number and pack a carton.

5. Label the carton with the same lot number and store in a contaminant-free area.

V. Oil and Grease

Container Types: 5 - 32 oz glass jar
7 - 8 oz glass jar

1. The containers, teflon liners, and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.

2. Rinse three times with tap water.

3. Rinse with ASTM Type I deionized water.

4. Dry in oven at 105°C for one hour.

5. Allow containers to cool and seal with teflon lined caps.

6. Label each container with color coded labels with lot number and pack in a sealable carton.

7. Place identical labels on exterior of carton and store in a designated contaminant-free area.

SAMPLING and ANALYSIS PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION
OPERABLE UNIT FINAL SAMPLING AND ANALYSIS PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
REMEDIAL PROJECT MANAGEMENT SECTION
FEDERAL SITE MANAGEMENT UNIT
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

JUNE 1990

PROJECT NO: 1681-3-CG-GEAD

16814/02.1

SAMPLING AND ANALYSIS PLAN

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

This Sampling and Analysis Plan (SAP) describes the field activities required for the Operable Unit in the Southeast Rockford Groundwater Contamination Area. The objectives of the sampling program are as follows:

- Determine the need for an alternate water supply in areas affected by the contaminant plume;
- Obtain water quality data from residential and industrial wells in areas where gaps currently exist;
- Evaluate current risks to public health resulting from the contaminated groundwater; and
- Acquire information needed to assess feasible remedial actions.

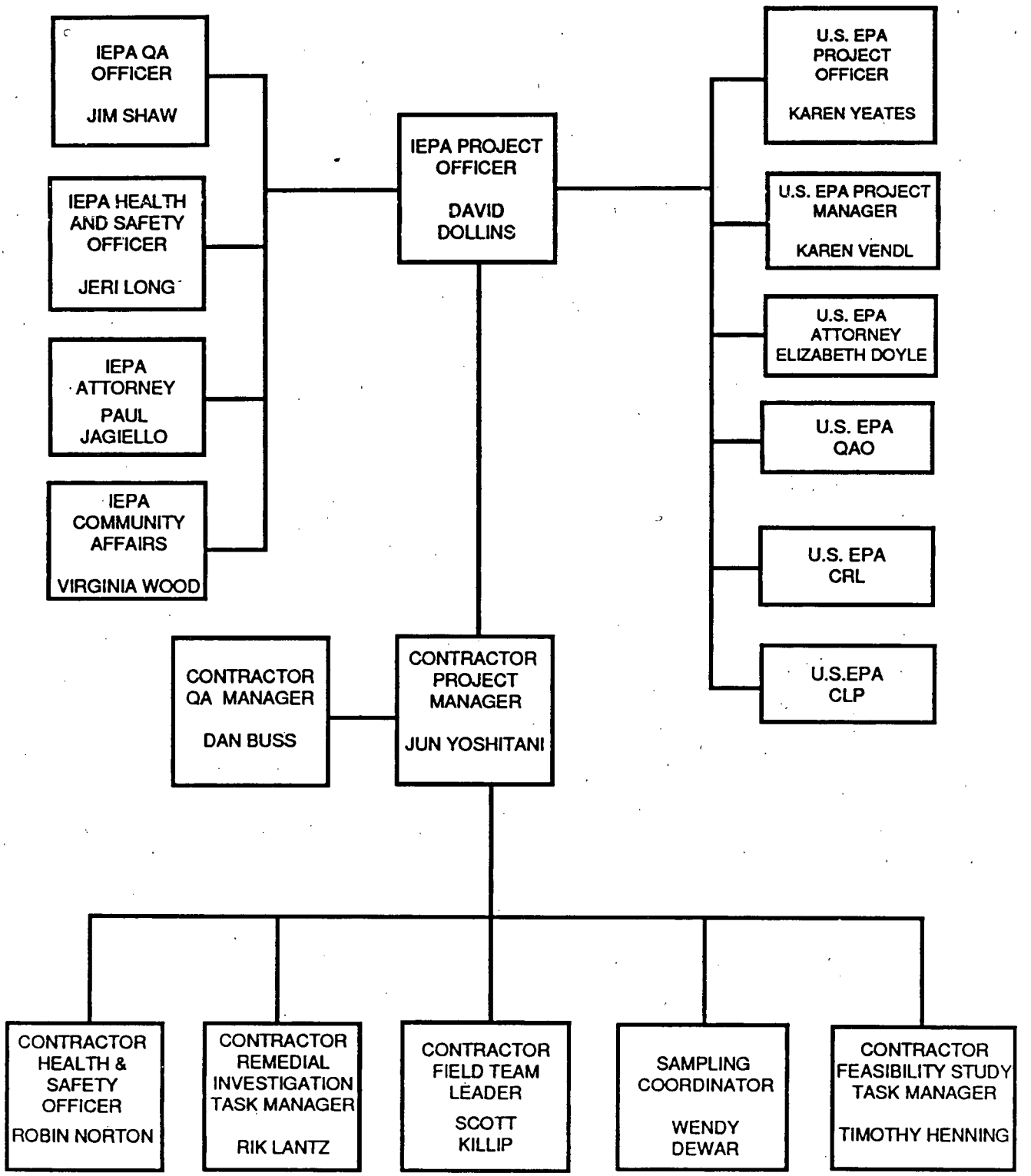
1.2 SAMPLING TEAM RESPONSIBILITIES

Field sampling will be performed by Camp Dresser & McKee (CDM). The Field Operations Organization is shown in Figure 1-1. Responsibilities of the sampling team are described below.

Field Manager

The Field Manager (FM) (in conjunction with the Site Manager), will be responsible for assigning responsibilities to members of the sampling team, as well as overseeing all field activities. The FM will coordinate mobilization and demobilization for the sampling team, as well as for any subcontractors. The FM will be responsible for keeping the Site Manager up to date on all sampling and subcontractor activities.

FIGURE 1-1
SOUTHEAST ROCKFORD OPERABLE UNIT
ORGANIZATION CHART



Sampling Team Leader

The Sampling Team Leader (STL) will be responsible for the sampling activities, will assure the availability and maintenance of all sampling equipment and materials, and will maintain an adequate supply of shipping and packing materials. The STL will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of field log books, and provide close coordination with the Field Data Coordinator (FDC) and the Field Manager (FM). The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will perform field measurements, collect samples, prepare samples for shipping, and decontaminate sampling equipment, as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will remain in the Support Area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control forms. The FDC will also be responsible for maintaining communications with on-site personnel and off-site laboratory personnel, as well as for logging all communications and site entries and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is also responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety

Assurance Manual and site Health and Safety Plan. The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

Safety Technician

The Safety Technician (a designated member of the sampling team) will aid other Sampling Team Members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculate, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

1.3 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities covered by this plan include the collection and analysis of 204 samples: 155 of these samples are investigative, 17 are field duplicates, 15 are trip blanks and 17 are field blanks. Samples will be collected from residential, municipal and industrial wells. The sampling and analysis program, including specific parameters which will be analyzed and quantity of quality control samples, is summarized in Table 1-1. Samples will be collected over a period of two weeks.

TABLE 1-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

			QA Samples								Matrix
			Investigative Samples			Field Duplicate			Field Blank		
Sample Matrix	Field Parameters	Laboratory Parameters	No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	Total
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	144	1	144	15	1	15	15	1	15	174
		SAS for metals from CLP[2]	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	1	1	1	1	1	1	1	1	1	3
		SAS for metals from CLP[2]	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	10	1	10	1	1	1	1	1	1	12
		SAS for metals from CLP[2]	10	1	10	1	1	1	1	1	1	12

* A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

** One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

[1] CLP SAS volatile parameters are listed in Table 5-1 of the QAPP.

[2] CLP SAS metal parameters are listed in Table 5-2 of the QAPP.

2.0 SAMPLE LOCATIONS AND RATIONALE

Because IDPH has sampled the Southeast Rockford area extensively since 1984, as discussed in the Work Plan, the IDPH data set was considered along with the TAT data set, in determining the current concentrations of contaminants across the study area. Movement of contaminant plumes throughout the subsurface can cause concentrations to vary with time, as measured at a single location, such as a private well. In order to minimize any potential effects related to temporal variations in contaminant concentrations, only data from 1988 to the present was considered in this study. The existing data in conjunction with the information provided by the IEPA well survey was used to design the sampling network described below. Figure 2-1 shows the current contaminant plume as defined by the existing data.

2.1 RESIDENTIAL WELL SAMPLING

CDM proposes to collect 144 investigative samples (not including QA/QC samples) from residential wells in the study area to complement the USEPA/TAT and IDPH data and to more accurately define those residences affected by groundwater contamination. The principal objective of the sampling during the Operable Unit is to identify residential wells in the study area that 1) are contaminated at levels between the MCLs and the method detection limits for the contaminants of concern; 2) are not currently served by municipal water; and 3) will not be served by the extended watermains to be installed by the USEPA. An additional objective of sampling is to maximize data coverage by avoiding resampling of residences that have been previously sampled. Therefore, the proposed sampling locations are concentrated outside of the known plume area (areas that were not sampled during previous studies or areas where previous sampling indicates variable contaminant concentrations). However, a small amount of resampling of residences previously sampled by IDPH is proposed

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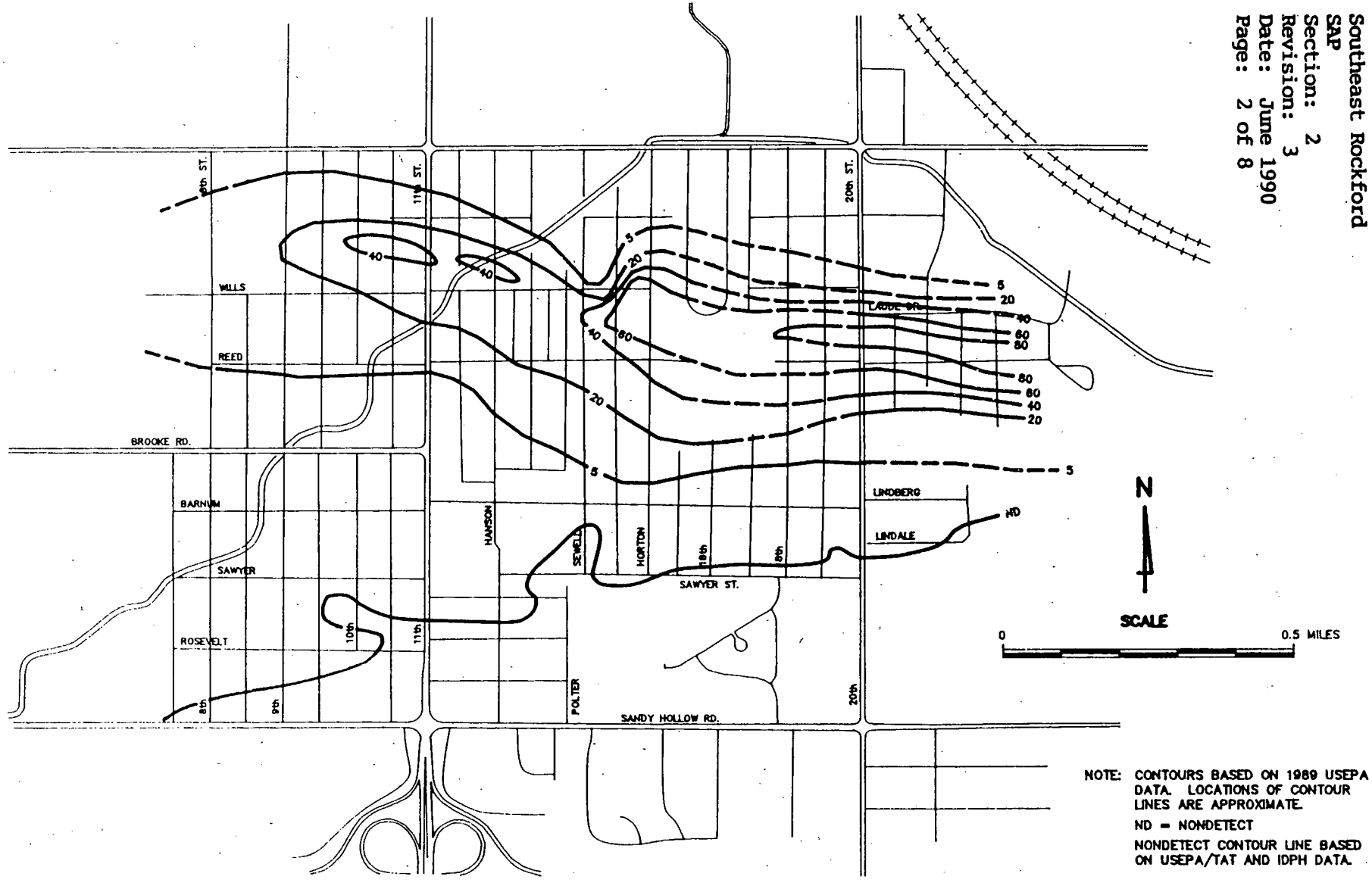


NOTE: CONTOURS BASED ON 1989 USEPA DATA. LOCATIONS OF CONTOUR LINES ARE APPROXIMATE.

ND = NONDETECT

NONDETECT CONTOUR LINE BASED ON USEPA/TAT AND IDPH DATA.

CDM
environmental engineers, scientists, planners, & management consultants

TCE CONCENTRATION IN PRIVATE WATER WELLS (in ug/l)

FIGURE NO.
2-1

(approximately 7 percent of the number of investigative samples) to assess plume movement, seasonal effects, and to verify comparability of data from the current study with data from previous studies.

IEPA has conducted a residential well survey to identify residents in the study area that may use private wells to obtain potable water. The survey was conducted by directly sending questionnaires to residents that may be affected by the groundwater contamination. The survey coverage is not complete; areas south of Sawyer Road were not contacted, and no response to the survey was obtained for about 25 percent of the residences in the area covered by the survey. The area south of Sawyer Road is currently being addressed by IEPA by the ongoing residential well survey. The existing survey data is the most current and applicable data regarding existence of private water supply wells in the area, therefore the survey results were the primary resource used to determine proposed sample locations for the IEPA Operable Unit. The survey results as of April 4, 1990 were used to determine the sample locations.

In areas where the IEPA residential well survey did not provide information on the use of private wells, city of Rockford billing records supplied by Virginia Wood of IEPA were used to determine private well use. Because of known inaccuracies in the billing records, some sample locations in the area south of Sawyer Road were selected in areas where the billing records indicate that there may be no private wells, in order to achieve adequate sample coverage. In those areas, locations of private wells will be identified by the residential well survey currently being conducted by IEPA. Existence of private wells will be confirmed in the field prior to collecting samples.

A third source of information used in selecting sample locations was previous sampling events by IDPH and USEPA/TAT. Residences that hve been sampled by USEPA were identified from chain-of-custody records and residences sampled by IDPH were identified from a database listing provided

by Clay Simonson of IDPH. Residences that have been sampled since 1988 were avoided in the proposed sample locations. However, in order to assess data comparability and potential plume migration, an overlap of approximately 7 percent was allowed between residences previously sampled by IDPH and proposed sample locations.

Finally, the area within the plume as defined by the existing data, areas to be served by the USEPA Removal Action proposed water main, and residences previously sampled by USEPA have been excluded from the proposed sample locations. The area to be addressed by the Removal Action has been determined based on a map provided by USEPA.

Using these sources of information, a list of proposed sample locations was developed, which is included as Table 2-1. A map of proposed and existing sample locations is included as Plate A attached to the back cover of this document. Because of the inaccuracies inherent in the database regarding locations of private wells in the study area, these sampling locations should be considered tentative, and may be modified in the field depending on access, the presence of private wells, and other factors. Any remaining data gaps or inaccuracies in the proposed sampling locations will be addressed in the field by a door-to-door survey. Alternate sample locations will be chosen as close to original locations as possible.

In order to achieve sample coverage in a cost-effective manner within the areas to be sampled, a total of 144 investigative sample locations are proposed, which will define the horizontal extent of groundwater contamination within a lateral resolution of one block or better. Because the depths of the screened intervals for private wells at the proposed sample locations are not known, it is not anticipated that the proposed samples will define vertical extent of groundwater contamination. This information will be requested during sampling, but it is doubtful that local residences will have this information.

Table 2-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address	Street	Address	Street	Address
4th	2805	11th	3015	Brooke	106
4th	2820	11th	3119	Brooke	202
4th	2917	11th	3208	Brooke	326
4th	3011	11th	3215	Brooke	411
4th	3045	11th	3301	Brooke	430
5th	2604	11th	3329	Brooke	613
7th	3115	15th	3135	Brooke	823
7th	3221	16th	3102	Brooke	914
7th	3305	16th	3122	Brooke	1101
7th	3337	17th	2602	Brooke	1202
8th	2914	17th	3120	Brooke	1317
8th	3009	17th	3141	Collins	2801
8th	3109	18th	3110	Collins	2825
8th	3138	19th	2622	Collins	3029
8th	3201	20th	2703	Collins	3109
8th	3237	20th	2717	Collins	3126
8th	3301	20th	3109	Collins	3245
8th	3337	Barnum	305	Collins	3310
9th	2624	Barnum	409	Fitch	407
9th	2730	Barnum	505	Fitch	507
9th	2808	Barnum	611	Fitch	601
9th	2842	Barnum	825	Fitch	807
9th	2927	Bildahl	3009	Grant	3045
9th	3102	Bildahl	3017	Grant	3107
9th	3210	Bildahl	3038	Hamilton	1735
9th	3245	Bildahl	3122	Harrison	733
10th	2627	Bildahl	3141	Harrison	1001
10th	3110	Bildahl	3206	Harrison	1713
11th	2613	Bildahl	3302	Harrison	1817
11th	2955	Bildahl	3338	Harrison	2315

Table 2-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address	Street	Address
Johnson	1737	Ranger	801
Kennon	315	River Blvd.	3007
Kennon	415	River Blvd.	3117
Kennon	517	River Blvd.	3125
Kennon	621	Rock Riv. Ave	508
Kishwaukee	3037	Roosevelt	843
Kishwaukee	3112	Sandy Hollow	728
Kishwaukee	3302	Sandy Hollow	826
Kishwaukee	3336	Sandy Hollow	1202
Lapey	3013	Sandy Hollow	1306
Lapey	3038	Sandy Hollow	1820
Lapey	3137	Saner	2905
Lapey	3213	Saner	3011
Lapey	3230	Saner	3110
Lapey	3325	Sawyer	319
Lindale	2406	Sawyer	407
Lindale	2620	Sawyer	525
Lindberg	2412	Sawyer	615
Lindberg	2619	Sewell	2622
Lyran	1616	Sewell	2646
Lyran	1701	Sewell	3137
Marshall	3125	South	527
Marshall	3137	South	619
Martin	430	Taft	801
Martin	508		
Martin	618		
Mattis	827		
Olsen	2812		
Pershing	1637		
Pershing	1726		

In the area west of 8th Street proposed sample locations were selected with a sample density of one sample per block. Because the residential well survey has not yet been completed, some proposed sample locations were chosen at residences where existence of a private well has not yet been confirmed. Consequently, it may be necessary to adjust these sample locations in the field. In this event, the target sample density of one sample per block will be maintained if possible. There is very little existing data in this area, therefore it is felt that a distribution of one sample per block is necessary to define the plume. This distribution alsoassumes that if water mains are installed in this area as part of the Operable Unit they will extend the entire length of the block because it will not be possible to determine any mid-block cutoffs with one sampling point per block.

In the area east of 8th Street, proposed sample locations were chosen by CDM in conjunction with IEPA and USEPA. For the purposes of this investigation, it has been assumed that existing USEPA/TAT and IDPH data adequately define the plume of VOC-contaminated groundwater at TCE concentrations greater than or equal to the MCL (5 ppb). All proposed sample locations have therefore been selected outside the 5 ppb TCE contour (Figure 2-1). The TCE plume was chosen to represent the extent of groundwater contamination by VOCs because the area represented by the plume of groundwater contaminated at levels exceeding the MCL for TCE encompasses all areas exceeding the MCL for the other VOCs detected at the site.

In those areas outside of the plume east of 8th Street, sample locations were selected based on existence of data gaps, presence of private wells, and previous sampling episodes. Within the constraints of these parameters, a sampling density of 1 to 2 samples per block was established as a goal, with the greater sample density concentrated near the margins of the plume. In this area it may be possible to have better lateral definition of the affected blocks by using a combination of existing and new data. This will be dependent on the degree of data comparability between the sampling events.

Figure 2-1 also shows the approximate contour line for homes with TCE values below detection limits based on existing IDPH and USEPA/TAT data. This line should be considered approximate because the data collection dates extend over two years (1988 and 1989) and the detection limits and analytical methods used have not been defined. The area east of 11th Street has been more extensively sampled than that area between 8th and 11th Streets. Therefore, a distribution of approximately one residence per block east of 11th Street and a distribution of two residences per block between 11th and 8th Streets were chosen based on the distribution of existing data. Sample locations have been selected both inside and outside the non-detect contour line. The sampling in areas outside the non-detect contour line is warranted in order to assess the extent of the metals contamination and in order to assess the cumulative health risks associated with the target volatile compounds (including TCE) that may be present at levels below the detection limits of the existing data.

2.2 INDUSTRIAL WELL SAMPLING

A review of aerial photographs indicates that there are approximately 26 sizeable industrial operations in the study area. Based on results of the response to the IEPA well survey, CDM will determine whether any of these industries are using groundwater as a potable water source. Only those industries using private wells for potable water will be sampled. It is anticipated that groundwater samples will be collected from a maximum of 10 industrial locations. Selection of industries to be sampled will be based on location with respect to the contaminant plume and accessibility of sampling, in addition to the requirement that the groundwater is used for potable water.

2.3 MUNICIPAL SUPPLY WELL SAMPLING

In addition to sampling residential and industrial wells, a sample from Municipal Supply Well 35, located at 2944 Bildahl, will be collected. This sampling will be conducted to provide information for subsequent FS tasks.

3.0 SAMPLING PROCEDURES

3.1 SAMPLE COLLECTION

The sampling procedure for residential, industrial and municipal wells for metals and VOC analysis is briefly summarized as follows:

- The closest accessible sampling point to the well (sink faucet, influent valve for water softener, etc.) will be fully opened and allowed to purge until a stable water temperature is attained. This will be determined by direct measurement of the flowing water with an electronic thermometer on one-minute intervals. Once the flowing water has stabilized to $\pm$ 0.5°C for three consecutive measurements, the water temperature will be considered stable and sampling will commence.

- Every attempt will be made to sample a point of influent closest to the well in order to bypass any carbon filtration, water softening system, or any other influent purifying or filtration system. In the event that an influent sampling point cannot be located before the influent is treated by a water purifying system, the point of sampling and the type of purification system(s) will be documented in the field notebook.

- Because these samples will be collected from sample points prior to any treatment (such as chlorination) it will not be necessary to test for the presence of chlorine in the samples.

- pH, specific conductivity and temperature will be measured and recorded in accordance with procedures described in Appendix A to this Sampling Plan. A flow rate of approximately 100 ml/minute (as measured with a graduated cylinder and a portable timepiece)

will be attained and an appropriate number of decontaminated 40-ml VOA bottles will then be slowly filled, leaving no headspace (air bubbles) in the sample bottle. Care will be taken during filling the sample bottles to avoid agitation of the water. No chemical preservatives will be added to VOA samples.

- After filling the sample bottle, the cap will be securely tightened and the bottle will be inverted and tapped firmly on the heel of the hand. If bubbles are visible, the bottle will be emptied and a new sample will be collected.

- Following sample collection for VOC analysis, the water flow from the tap will be increased to a nominal rate and a one-liter polyethylene sample bottle will be filled with tap water to a level equal to the shoulder of the sample bottle.

- Nitric acid (HNO_3) will be added as a preservative to the sampled water in the amount necessary to reduce the pH of the water to <2. The pH of the sample will be tested with litmus paper on all samples collected for metals analysis.

- The filled sample bottles will be decontaminated by rinsing with deionized water.

- The sample bottles will be sealed in a zip-lock bag and immediately placed in an iced cooler.

- Surgical gloves will be worn by the sampler while collecting the sample to avoid cross-contamination.

If the industrial or municipal wells have been pumping within the last 6 hours they will be purged using the same procedure as for the residential wells. If a well has been inactive for more than 6 hours, the effort will

be made to pump the well until the system piping has been purged. An estimate of system volume will be made and temperature will be used to determine stabilization as previously described. Once the system is purged/stabilized, the sample will be collected using the previously described procedure. As with residential sampling, all efforts will be made to collect a sample prior to any treatment or filtration.

Further details of sampling procedures for the collection of water samples from residential water supplies are described in Appendix B to this Sampling Plan.

3.2 SAMPLE CONTAINERS AND PRESERVATION

Four 40-ml glass VOA bottles for VOC analysis and one 1-liter polyethylene sample bottle for total metals analysis will be collected at each sample location, in accordance with the October 27, 1989 USEPA Region V Sample Handling Manual. Sample bottles and vials will be supplied by the IEPA Sample Bottle Repository. Samples will be analyzed by a laboratory certified by the Contract Laboratory Program (CLP). At sample sites where duplicate samples will be collected, double sample volume (eight 40-ml glass vials and two 1-liter polyethylene bottles) will be supplied to the lab for analysis. At sample sites where matrix spike/matrix spike duplicates (MS/MSD) are collected, eight 40-ml glass vials will be supplied to the lab for analysis. No additional sample volume of water for metals analysis will be required or supplied to the lab for MS/MSD analysis. Samples for VOC analysis will not be preserved with HCL but will be chilled in an iced cooler to a temperature of 4°C. Samples for metals analysis will be preserved with nitric acid to a pH<2 (approximately 5 ml 1:1 nitric acid per bottle) and will not require cooling.

Sample collection, containerization and preservation will be performed in accordance with procedures in the USEPA Sample Handling Manual, contained in Appendix C to this Sampling Plan.

3.3 SAMPLE HOLDING TIMES

The respective sample holding time for drinking water analysis for volatile organics and total metals is 7 days and 6 months from sample collection to analysis. To expedite sample analysis, the samples will be shipped to the laboratory via an overnight carrier (i.e., Federal Express) on the day the samples are collected.

3.4 SAMPLE PACKAGING AND SHIPMENT

Following sampling, the sample bottle exteriors will be decontaminated near the sampling location, or rinsed with potable or distilled water prior to shipment. The Field Manager will help the Field Data Coordinator prepare documentation and package the bottles for shipment according to the following procedures:

- Ensure that the sample is properly preserved; tighten cap securely.
- Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material and maintain at 4°C with cold packs, or ice sealed in plastic bags (for VOC samples); fill remaining space in cooler with additional packing material.
- Put chain-of-custody forms and traffic reports in a zip-loc bag and tape to inside of cooler lid.
- Close cooler and seal with strapping tape; if cooler has a drain port, seal it with tape; place one custody seal across closure at front of cooler and across hinge area at back of cooler, or rear side corner.
- Affix airbill with shipper's and cosignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.

The Field Manager will contact the Sampling Coordinator to confirm sample shipment dates two weeks in advance for Special Analytical Service (SAS) analyses to CLP. The Field Manager will notify the Sampling Coordinator of any last minute changes in the sampling schedule.

Upon shipment of samples to the Laboratory, the Field Data Coordinator will call the Sampling Coordinator (before 5:30 p.m. Central Standard Time on the day of shipment, or early the following morning). The Sampling Coordinator must be notified by 2:00 p.m. on Friday for shipments to the CLP for Saturday delivery/pick-up. The Sampling Coordinator will be provided with the following information:

1. Case and/or SAS numbers (if applicable);
2. Name of laboratory(ies);
3. Date of shipment;
4. Carrier, airbill number;
5. Number and matrices of samples shipped; and
6. Information regarding changes and delays pertaining to the activity.

The Sample Identification Record form will be used to record this information. A copy must be sent to the Sampling Coordinator with the other sample documents, which include copies of the CRL Basic Data forms or SAS Packing List, and Chain-of-Custody forms.

The Central Regional Laboratory Sample Data Report form for samples being sent to the CLP must also be sent to the Sampling Coordinator. These forms are not sent to the CLP.

3.5 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody will be maintained throughout the sample preparation procedure as described in the Quality Assurance Project Plan (QAPP), Section 7.0.

- All information required on the custody tag, including the signatures of the sampling team leader and a predesignated location description, will be filled out in the field.

- Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which the team leader must sign.

- The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.

- The technician will package the samples for shipment ensuring that all traffic reports, chain-of-custody records and custody seals are cross-referenced and recorded on the Sample Identification Record Form and that all sample documentation paper work is enclosed.

- If VOC samples are stored temporarily, prior to shipment, they will be kept cool (4°C) and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

3.6 DOCUMENTATION

This section outlines the documentation required for all field activities and sample shipment to be conducted during the Operable Unit Field Activities.

3.6.1 FIELD LOG BOOKS

Field log books will provide the means of recording data collected during the performance of RI activities. As such, entries will be described in as

much detail as possible so that site personnel can reconstruct a particular situation without sole reliance on memory.

Field log books will be bound, field survey books. Log books will be assigned to field personnel, and stored in the document control center when not in use. Each log book will be identified by the project-specific document number.

The title page of each notebook will contain:

- Person or Organization to whom the book is assigned;
- Book Number;
- Project Name;
- Start Date; and
- End Date.

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, name of all team members present, level of personal protection being used, and the signature of the person making the entry will be recorded. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book. At the end of each day's activity, the log will be closed with the time and signature of the person making the last entry (log-closed line). The log-closed lines and the following log-open lines will be placed so that no unauthorized entries can be made in-between. A typical format is presented in Figure 3-1.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark.

Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which may include compass and

FIGURE 3-1

TYPICAL FIELD NOTEBOOK ENTRY FORMAT

LOG-OPEN TIME: _____ DATE: _____

SIGNATURE: _____

WEATHER: _____

_____

_____

FIELD PERSONNEL: _____ _____

_____ _____

_____ _____

LEVEL OF PERSONAL PROTECTION: _____

_____

EQUIPMENT (NAME/CONTROL NO.): _____

_____ Calibration Date: _____

Station No./Location Description: _____

_____

Film Roll Number: _____ Photograph Numbers: _____

Station No. _____ (Parameter (Units) _____

_____

Sampling Equipment: _____

_____

No.	Time	Sample Description	Depth	Number	Volume	Chest No.	Comments

distance measurements, shall be recorded. The number of the photographs taken of the station with a brief description and the direction faced will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected according to the procedures documented in the SAP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of sample containers. Sample location identifiers will be assigned prior to sample collection. Duplicates, which will receive a separate CRL sample number, will be noted under Sample Description.

3.6.2 SAMPLE IDENTIFICATION SYSTEM

U.S. EPA CRL SAMPLE NUMBER

Each sample will be assigned a U.S. EPA CRL sample number, regardless of the laboratory to which it is sent. The CRL sample number will consist of nine alphanumeric characters, as follows:

90RS01xyy

The first six characters (90RS01) will remain constant for RI sampling.

- 90 Fiscal year 1990
- R Indicates samples sent by CDM
- S Designates project manager
- 01 Designates survey number

The last three characters will vary during the sampling survey. The character "x" is a single digit alpha code designating the type of sample:

S Sample
D Duplicate sample
R Blank sample

The character "yy" is a 2-digit (01 through 99) number designating the sample number. After 99 samples have been collected for the survey, the survey number (characters 5 and 6) is changed. For S-type samples, "yy" is used to consecutively number samples taken during this survey. For duplicate (D-type) samples, "yy" is the same as the sample number of which it is a duplicate. For blank (R-type) samples, "yy" is the consecutive number of blank samples taken during this survey.

EXAMPLE U.S. EPA CRL SAMPLE NUMBERS

- 90RS01S01, 90RS01S02, 90RS01S03
  Samples No. 01, 02, and 03 of Clark's Survey No. 1.

- 90RS01D02
  Duplicate sample of Sample No. S02.

- 90RS01R01, 90RS01R02
  Blank sample No. 01 and 02.

The sample identification number(s) will be recorded in the field log book and on all other paperwork and labels and will be cross-referenced to chain-of custody and pertinent shipping documents. A description of the sample location will be entered into the field log book, including compass directions and distances from reference points, if applicable.

SAMPLE LOCATION IDENTIFICATION

For this project, samples will be collected from residential, industrial and municipal wells for the purpose of determining if the water exceeds drinking water standards. Each sample will be identified by the property address where the well is located. All sample location addresses will be recorded in the field notebook. The Sample Identification Record Form (Figure 3-2) will also be used for computer tracking and identification of each sample. All proposed sample locations and associated address identifiers are shown on Table 2-1.

The sample CRL number and traffic report or SAS number will be cross-referenced to the address location of the sample as recorded in the field book. Sample duplicates and matrix spike/matrix spike duplicates will be marked on the USEPA CRL sample documentation as described previously in this section.

3.6.3 SAMPLE DOCUMENTATION FORMS

Sample documentation required by the U.S. EPA are numbered and will be accounted for. If a document is voided, it should always be saved and returned it to the Sample Coordinator. Copies of the multiple-copy forms must accompany samples to the laboratory. The other copies must be sent to the Sampling Coordinator immediately following sampling shipment.

A) Chain-of-Custody Form

1) One form per shipping container (cooler) will be used.

2) Carrier service does not need to sign form if custody seals remain intact.

3) Will be used for all samples.

FIGURE 3-2

SAMPLE IDENTIFICATION RECORD FORM

SITE NAME ______________________ SITE NUMBER ____________

Case Number	Matrix	Lctn	CRL Number	Traffic Report SMO Number	Chain of Custody	Lab Code	Date Sampled	Date Shipped	Airbill Number	Sample Tag Numbers

WHEN FILLING OUT SAMPLE IDENTIFICATION RECORD FORMS:

1) ONLY ONE CASE NUMBER PER SAMPLE ID RECORD FORM

2) LIST TRAFFIC REPORT (SMO) NUMBERS IN NUMERICAL ORDER
(DO NOT LIST ACCORDING TO CRL NUMBERS)

B) Chain-of-Custody Seals

1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with.

2) Seals will be covered with clear tape.

3) Seal numbers will be record numbers on Chain-of-Custody Form.

4) Seals will be used for all samples.

C) Special Analytical Service Packing List

1) Up to twenty samples can be listed per form.

2) Will be used only for samples sent to CLP for SAS analysis.

3) Samples are numbered using the SAS number assigned by CLP followed by a hyphen and progressive numerical designations, beginning with 1 (e.g. 2000E-1, 2000E-2, 2000E-3, etc.)

4) If sampling extends over several days and more than one PL is used, care must be taken to not repeat sample numbers.

5) Sampler will include bottom 2 copies of form with sample shipment; top copy will be returned to SMO and the second copy will serve as the sampler's file copy.

D) Sample Tags

1) Each sample container will have a Sample Tag affixed to it with string or wire.

2) Traffic Report number and Case Number will be recorded in the "Remarks" section of the tag.

3) Sample Tag Numbers will be recorded on the Chain-of-Custody Forms.

4) Will be used for all samples.

E) CRL Sample Data Report

1) Will be completed for all CLP samples.

2) For samples sent to CLP Laboratories, these forms will be sent to Sampling Coordinator to be forwarded to the RSCC.

3) The forms will be necessary for the U.S. EPA to track the samples and ensure data validation.

F) Sample Identification Record Form

1) Will provide a means of recording crucial sample shipping and tracking information.

2) This form will be maintained for each sample shipment and forwarded to Sampling Coordinator upon sample shipment.

All paperwork accompanying the samples being shipped to the CLP laboratories will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the chain-of-custody forms, and other paperwork (if possible) will be retained for the field files.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag number, SAS numbers, analyses to be performed, custody seal number, shippers' airbill numbers, and consigned laboratories,

in a bound log book using black ink and on the Sample Identification Record Forms. For more details on sampling paperwork, refer to the "User's Guide to the Contract Laboratory Program", USEPA, Washington D.C., December 1986 and the excerpt from the USEPA Sample Handling Manual in Appendix C.

4.0 DECONTAMINATION PROCEDURES

Procedures to be followed to decontaminate equipment and personnel will be fully described in the SE Rockford Health and Safety Plan. The procedures are summarized below.

4.1 PERSONNEL DECONTAMINATION

Since sampling will be of drinking water samples, no work zones are anticipated. All necessary decontamination procedures will be conducted in accordance with the protocols set forth in the Site Health and Safety Plan.

4.2 EQUIPMENT DECONTAMINATION

Since sampling will be of drinking water samples, no equipment decontamination is anticipated.

4.3 SAMPLE BOTTLE DECONTAMINATION

Sample bottles for shipment to the laboratories will be decontaminated by rinsing the exterior with potable or distilled water. Solvents will not be used to wash sample bottles.

4.4 STORAGE AND DISPOSAL OF RI GENERATED WASTES

The sampling activities are not expected to generate solid and liquid "waste".

5.0 FIELD QUALITY CONTROL PROCEDURES

To ensure the level of data quality required for Superfund Remedial Investigations, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in Table 5-1.

Field Duplicates

One duplicate sample will be collected for every 10 samples (or portion thereof) collected in the field. Duplicate samples will be collected at the same sample volume and in the same type of container as the other samples.

Field Blanks

One field blank water sample will be prepared for every ten samples collected. Field blanks will be prepared by filling water sample bottles with reagent grade distilled water to the same volume as the drinking water samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field book log.

Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each sample shipment for volatile organic analysis. The trip blank will consist of 3 40-ml VOA vials filled with reagent grade distilled water. The trip blank shall be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CRL or CLP without being opened. The trip blank will be documented on a SAS report form for a shipment being sent to the Contract Laboratory Program. The trip blank

will be documented on the chain-of-custody form and on the CRL Data Form for a shipment being sent to the CRL.

Matrix Spike and Matrix Spike Duplicates (MS/MSD

One sample out of every 20 (or portion thereof) will be collected for MS/MSD analysis. Eight 40-ml VOA vials of water will be collected for each matrix spike sample, as specified in the USEPA Region V Sample Handling Manual. No additional sample volume will be required or supplied to the lab for MS/MSD metals analysis. The matrix spike sample will be denoted by the sample number followed by an -MSD suffix on sample tags, chain-of-custody forms, and other appropriate sample paperwork.

Table 5-1: Summary of QC Sample Requirements

Sample Type	Sample Volume	Frequency	No. of Samples
Residential Well	4-40 ml VOA vials 1-1 liter poly bottle	N/A	144
Industrial Wells	4-40 ml VOA vials 1-1 liter poly bottle	N/A	10*
Municipal Well	4-40 ml VOA vials 1-1 liter poly bottle	N/A	1
Duplicate	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
Field Blank	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
Matrix Spike Duplicate	8-40 ml VOA vials	1:20	10
Trip Blank	4-40 ml VOA vials	1 per shipment	15*

* Approximate

APPENDIX A

PROCEDURES FOR MEASUREMENTS OF pH, SPECIFIC CONDUCTANCE, AND TEMPERATURE OF WATER SAMPLES

Field Measurement of pH in Water

1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occuring at the sampling location.

2. Summary of Method

The pH of water is determined using a portable, field pH meter with a temperature-compensated combination electrode.

3. Apparatus

A) Hoake Buchler pH Meter Stick
B) 100 ml disposable beakers

4. Reagents

A) pH reference buffer solutions:

1) pH = 4.00 $\pm$.01
2) pH = 7.00 $\pm$.01
3) pH = 10.00 $\pm$.01

B) distilled water

5. Sample Handling and Preparation

Sample aliquots for pH measurement should be obtained directly from the sampling point in 100 ml disposable beakers.

6. Calibration

Calibrate the meter/electrode using two reference solutions that bracket the expected pH of the sample. Reference solutions should be at room temperature. Immerse the electrode in pH 7.00 solution and adjust the meter as needed. Remove and rinse the electrode and repeat using the second buffer solution. Repeat adjustments until readings are within 0.05 pH units of the reference values. For additional information see SIPM Method 6617003.

7. Procedure

Immerse the electorde in the water while gently agitating. After about one-half minute, record the pH reading to the nearest 0.05 units -- provided the meter readings are not fluctuating more than ±0.03 units. Be sure that temperature compensation has been provided for. Remove and thoroughly rinse the electrode with distilled water. Repeat the measurement procedure until four readings have been obtained. For additional information see SIMP Method 5617003.

8. Interferences

Prolonged immersion of the electrode in turbid solutions can lead to plugging of the liquid junction and erratic meter readings. The electrode should be cleaned by gently blotting with a lab tissue and rinsing with distilled water.

9. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed electrode in each of the reference buffer solutions used to calibrate the meter/electrode prior to sample measurements. If the readings are not within 0.05 units of the reference values, recalibrate the meter/electrode and re-do the measurement of the sample just tested.

10. Assessment of Precision

Calculate the mean and standard deviation of the four replicate measurements. If the standard deviation is greater than 0.1 units, re-do the measurement of the sample just tested including calibration and verification.

11. Reporting

Report the average value of the replicate measurement to the nearest 0.1 units.

Field Measurement of Specific Conductance and Temperature

1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occuring at the sampling point.

2. Summary of Method

The specific conductance and temperature of water is determined using a portable, field conductivity meter having manual temperature compensation.

3. Apparatus

A) YSI Model 33 S-C-T Meter with weighted probe
B) 100 ml disposable beakers

4. Reagents

A) 0.01 N KCL reference solution
B) distilled water

5. Sample Handling and Preparation

Sample aliquots for specific conductance and temperature should be obtained directly from the sampling point in 100 ml disposable beakers.

6. Calibration

Calibrate the thermometer in the probe against the field thermometer. Readings should be within ± 1°C. Calibrate the specific conductance meter using the 0.01 N KCL reference solution. The specific conductance of this solution is 1413 umhos/cm at 25°C. Adjust the meter as needed. Temperature calibration should be performed weekly. Specific conductance calibration should be performed daily during the period of use. For additional information see SIPM Method 6617002.

7. Procedure

Check battery condition by turning selector dial to "Red Line". Adjust meter as needed. Immerse the probe in the beaker while gently agitating. Turn selector dial to "Temperature" and record temperature to nearest 0.5°C. Adjust manual temperature compensation dial to temperature of water. Turn selector dial to "Conductivity" at the scale range appropriate to sample conductance. Record specific conductance to three significant digits. Remove and thoroughly rinse the conductance probe and repeat measurements until four sets of readings have been obtained. For additional information see SIMP 5617002.

8. Assessment of Precision

Calculate the mean and standard deviation of the four specific conductance measurements. If the standard deviation is greater than 5% of the means, re-do the measurement of the sample just tested.

9. Reporting

Report the average values of the replicate measurement to the nearest 1°C for temperature and to three significant digits for specific conductance.

APPENDIX B

COLLECTION OF WATER SAMPLES FROM RESIDENTIAL WATER SUPPLIES

COLLECTION OF WATER SAMPLES FROM RESIDENTIAL WATER SUPPLIES

1.0 INTRODUCTION

This procedure shall be used to collect samples from existing residential water supplies for all non-microbiological analyses. The primary objective of this technique is to collect a sample representative of the groundwater supply and not water standing in the delivery system or well casing.

In a nonpumped well, there will be little or no vertical mixing of the water, and stratification may occur. Water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. Stagnant water may contain foreign material inadvertently or deliberately introduced from the surface, resulting in nonrepresentative data and misleading interpretations.

In most cases, groundwater samples from existing residential water supplies are obtained from taps or spigots on the existing delivery system. The installation of a new tap for sampling purposes is not usually warranted. Samples should be collected from the tap closest to the well as practical and upstream of any filtration or water treatment device.

Two separate operational steps are required to obtain a representative sample.

- o presampling system purging, followed by
- o sample collection

2.0 PRESAMPLE PURGING

Before any samples are collected, all standing (stagnant) water should be purged or removed from the delivery system. The volume of water contained in the well casing, pressure or holding tanks, and other plumbing and appurtenances (pipes, hoses, etc.) should be determined.

The system should then be purged with a minimum of three (3) times the calculated casing volume before sampling commences. Care should be exercised before pumping a well to preclude the possibility of overpumping. Excessive pumping can result in flow entering a well from outside the zone of interest. The purging necessary to obtain a sample representative of the groundwater supply depends on a number of factors;

- o pump intake level
- o specific capacity of the aquifier
- o well efficiency

Information obtained during pumping is required to determine the specific capacity of the aquifier and well efficiency, therefore, the purging volume can only be estimated for a specific well for the initial sampling. Well performance data from the initial sampling should be recorded for future sampling.

If the sampling tap or spigot has an aerator or filter, it should be removed prior to purging and sampling. Provisions should also be made to dispose of the presample purge water.

For most sampling, purge water may be discharged directly to the sanitary sewer or on the ground at least thirty (30) feet from the well. If gross contamination of the purge water is anticipated, provisions should be made for proper containment and disposal. Ideally, the contaminated purge water should be contained and stored until the water samples have been analyzed. Once the contaminants

have been identified, appropriate treatment and/or disposal alternatives can be determined.

3.0 SAMPLING

After the required volume of water is purged from the delivery system, the sampling tap should be shut off. Sample bottles with required preservatives should then be brought to the sampling point. Turn tap on, adjusting the flow to about 100 ml/min. Fill sample bottles as required for specific analyses to be completed. Shut off tap. Reconnect all filters, aerators, and treatment systems.

In addition to information normally recorded in field notebook (as described in Procedure 5621004), the following information should be included:

- resident's name
- address
- sampling location (specific tap or spigot)
- filtering or treatment systems on delivery system
- aerator or filter on sampling tap
- well casing diameter (ID)
- water level
- well volume
- pressure on holding tank volume
- appurtenances and other plumbing volume
- total delivery system volume
- purge flow rate
- purge time
- total purge volume

4.0 REFERENCES

NEIC Manual for Groundwater/Subsurface Investigations at Hazardous Wastes Sites (July 1981) Steven W. Sisk

National Enforcement Investigations Center, Denver, Colorado

Manual of Groundwater Sampling Procedures, Scalf, McNabb, Dunlap, Cosby, Fryberger NWWA/EPA Series

APPENDIX C

EXCERPT FROM USEPA SAMPLE HANDLING MANUAL

SAS PACKING LIST

1. Insert assigned SAS case number.
2. Insert EPA region number, V and your contractor company name.
3. Insert sample team leader's name.
4. Insert sample team leader's office telephone number (do not use field office telephone number).
5. Insert date sample was taken.
6. Indicate date of shipment.
7. Insert the site name only if it does not copy onto the lab's copy (see note below). Also list the site/spill ID.
8. Insert laboratory name and address, and the carrier name and airbill number.
9. Indicate name of laboratory contact.
10. List SAS sample numbers, which should include SAS number (i.e., if the SAS # is 2743E, the samples would be numbered as 2743E-01, 2743E-02, etc.)
11. Specify sample matrix, concentration, tag number, and analysis to be performed (e.g., low concentration soil sample for PCB analysis, tag number 5-48246).
    Indicate whether shipment is complete at the bottom of the form.
12. Leave BLANK - laboratory use only.

NOTE: The site name should not be written on this form while all copies are attached if there is no protection to prevent the site name from appearing on the lab's copies. The CLP laboratory should not have this information. Therefore, either use a site code or separate the copies and only write the site name on the Regional and SMO copies of this form, if necessary.

THIS IS A FOUR COPY FORM:
The top copy should be sent to SMO within a day or two of shipping samples.

The second (yellow) copy should be sent with other paperwork for a site to the Region V RSCC.

The bottom two copies (pink and gold) get sent to the CLP laboratories with the samples.

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

SAS Number (1)

SPECIAL ANALYTICAL SERVICE
PACKING LIST

Sampling Office: (2)	Sampling Date(s): (5)	Ship To: (8)	For Lab Use Only
Sampling Contact: (3) (name)	Date Shipped: (6)		Date Samples Rec'd:
(4) (phone)	Site Name/Code: (7)	Attn: (9)	Received By:

	Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.	(10)	(11)	(12)
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
			For Lab Use Only

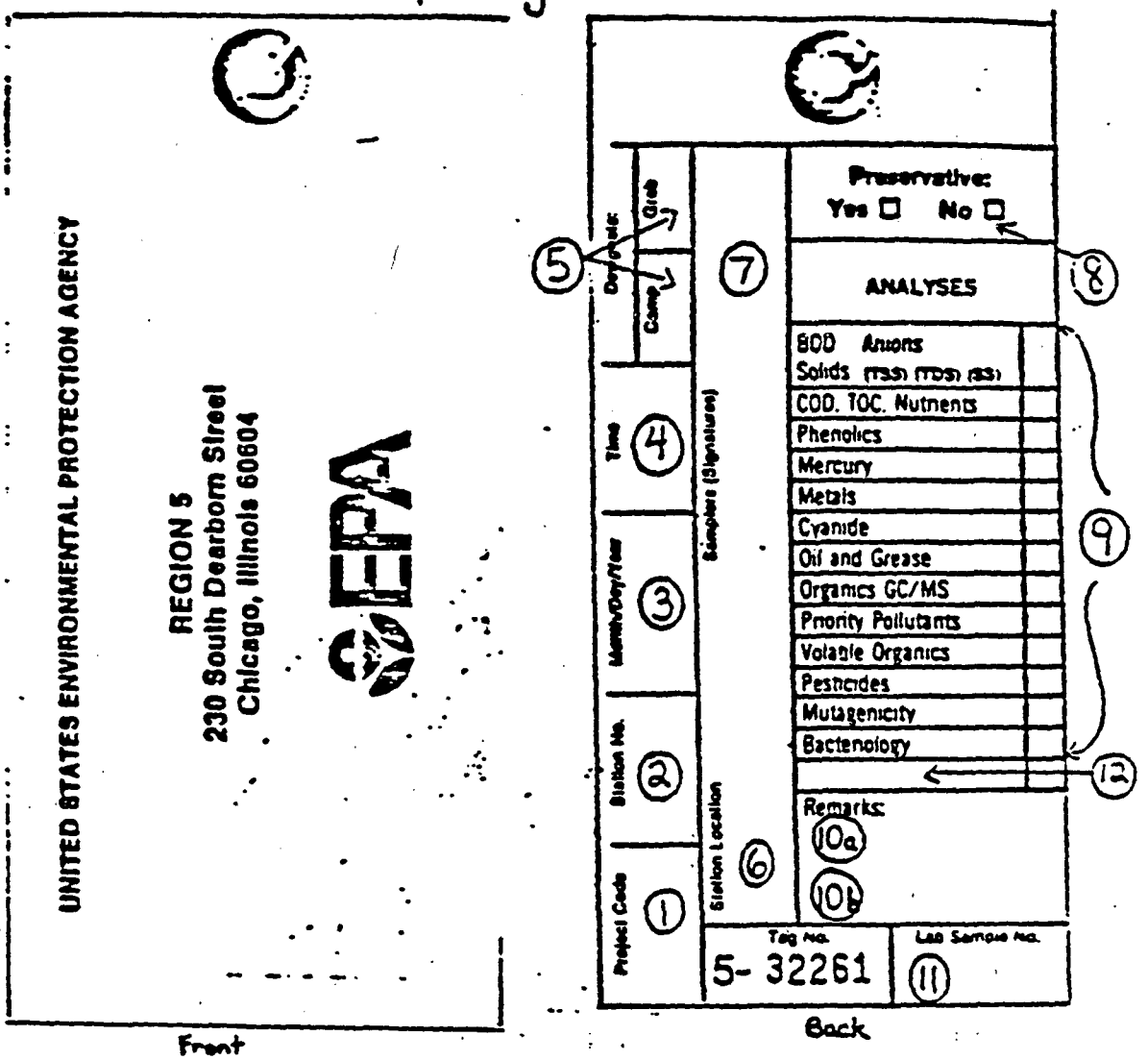
White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

SAMPLE TAG

1. Enter your project number for the site, which may be the first six digits of the CRL log number (see page C-21).
2. Enter the sampling station code, i.e., MW1, BLK, SS1, etc.
3. Enter date of sampling.
4. Enter time of sampling (military time only).
5. Specify "grab" or "composite" sample with an "X".
6. Insert station location. If the sample is a field blank or if to be used for the spike or duplicate analysis, notate here.
7. Obtain signature of sample team leader.
8. Indicate presence of preservative with an "X".
9. Specify analytes for analysis with an "X".
10a. Indicate traffic report number (i.e., EW846 or MEX013) for that sample if the samples are being shipped to the CLP. If the samples are going to the CRL, list the CRL log number.
10b. Indicate the case number.
11. Leave BLANK (for laboratory use only).
12. Enter any desired analyses not listed on the tag provided (e.g., PCB's, ammonia, sulfide, etc.) and mark the box with an "X".

NOTE: Each sample container should have a separate tag.
All field blanks should be designated as such on the sample tags, either in the 'Remarks' field (10a and 10b) or in the 'Station Location' field (6).

Sample Tag



Each cooler should have 2 COC seals applied.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
OFFICIAL SEAL

No. 13400

Chain of Custody Seal

INTRODUCTION AND INSTRUCTIONS FOR USE OF MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS

A. Introduction: Samples and Sample Numbers

Contract Laboratory Program (CLP) multi-sample Traffic Reports (TRs) can document up to twenty samples shipped to one CLP laboratory under one Case Number. The TRs must be used for every shipment of RAS samples to a CLP laboratory.

The CLP's definition of "samples" is based on the RAS analytical program: (1) organic, (2) VOA only (3) inorganic.

A CLP sample is one matrix — water or soil — and consists of all the sample aliquots from a sample station location for analysis in one RAS analytical program. The CLP assigns a unique Sample No. to each such set of aliquots sent to one CLP laboratory. The unique Sample Numbers are printed on the adhesive labels. The samplers must accurately transfer this critical Sample Number to the TR.

Organic Sample Numbers are in the format XX123, and have six labels per strip: four for extractables, and two for VOAs (see attachment). CAUTION: The organic sample labels provide two options for each Sample No. — labels for water samples and labels for soil samples. USE ONLY ONE OF THE TWO OPTIONS. An individual sample will be analyzed as EITHER a water or a soil, but never both. DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see attachment). Remember that the unique Sample No. must only be used once so DESTROY THE EXTRA LABELS.

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are an alphanumeric code specific to each Region:

Letter Code Organic, Inorganic	Region	Letter Code Organic, Inorganic	Region
A, MA	I	F, MF	VI
B, MB	II	G, MG	VII
C, MC	III	H, MH	VIII
D, MD	IV	Y, MY	IX
E, ME	V	J, MJ	X

REMEMBER:

- TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- Organic samples, "VOA Only" samples, and inorganic samples are assigned separate, unique Sample Numbers. Each consists of all the sample aliquots from a sample station location.
- A CLP RAS sample will be analyzed as either a water or a soil sample.
- Prevent accidental duplication of Sample Numbers by destroying unused labels.
- Use only the Sample Numbers specific to your Region.

B. Completing the Form - Case Documentation

Enter the Case No. and SAS No. (if applicable) at the top right of the form. Complete the boxes in the header:

Box No. 1:

Type of Activity:

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

PA -	Preliminary Assessment
SI -	Site Investigation
ESI -	Expanded Site Investigaiton
RIFS -	Remedial Investigation Feasiability Study
RD -	Remedial Design
RA -	Remedial Action
ER -	Emergency Response (Removal)
NPLD -	National Priorities List Delete
O + M -	Operations and Maintenance

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA. Enter the site name, the city, state, and Site Spill ID (provided by Region) in the designated spaces.

Box No. 2:

Regional Information

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

Box No. 3:

Ship To:

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

Enter the beginning and ending sampling dates in the designated spaces.

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Purolator, etc.) and the airbill number in the appropriate spaces.

C. Completing the Form - Sample Documentation

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through E to describe the sample:

Column A, Sample Description:

Enter the appropriate sample description code from Box 6. NOTE: Describe RINSATES or BLANKS as #3 "Leachate" in Column A. Write the word "Rinsate" or "Blank" in Column D, the Special Handling section, or in Column E, the Station Location section. Note: Item #3 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste without making prior arrangements with SMO.

Column B, Concentration:

Organic - If sample is low or medium concentration, enter "L". When shipping RAS plus SAS high concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS plus SAS arrangement). REMINDER: Ship medium and high concentration organic and inorganic samples in metals cans.

Column C: RAS Analysis:

Check the analytical fractions requested on each sample.

Column D: Special Handling:

Use this space to relevant specify any special handling requirements. Rinsate or blank samples should be identified as such in this space. When shipping RAS plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B - Cl, etc.) and enter the codes in this column.

Column E: Station Location:

Enter the station location in the space provided.

IMPORTANT: SAMPLERS MUST INDICATE ON EACH TRAFFIC REPORT WHETHER SAMPLING IS COMPLETE OR IF MORE SAMPLES WILL BE SHIPPED UNDER THE SAME CASE NUMBER. THIS STATEMENT CAN BE WRITTEN ANYWHERE ON THE FORM THAT DOES NOT OBSCURE NECESSARY INFORMATION, AND CAN BE AS SIMPLE A STATEMENT AS " SHIPMENT COMPLETE FOR THIS CASE" OR "MORE SAMPLES TO COME UNDER THIS CASE."

SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22314
(703) 557-2490 FTS 557-2490

T J U 7 1 (IF APPLICABLE)

ORGANIC TRAFFIC REPORT

FOR EPA USE ONLY

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA (SI) ESI RI/FS RD RA ER
NPLD O&M OTHER _____
NON-SUPERFUND—_____ PROGRAM

SITE NAME: Cheer's Dump
CITY, STATE: Boston, MA. SITE SPILL ID: ZZ
REGION NO: I SAMPLING COMPANY: ② Acme
SAMPLER: (NAME) Geo Lozier

SHIP TO: ③ Spectrix
3911 Fondren
Suite 100
Houston, TX
ATTN: Ted Osterman

SAMPLING DATE: ④
BEGIN: 8/10/87 END: 8/11/87
DATE SHIPPED: 8/11 CARRIER: E ⑤
AIRBILL NO: 123-456-7890

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1. SURFACE WATER
2. GROUND WATER
3. LEACHATE
4. SOIL
5. SEDIMENT
6. OIL (SAS)
7. WASTE (SAS)

TRIPLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

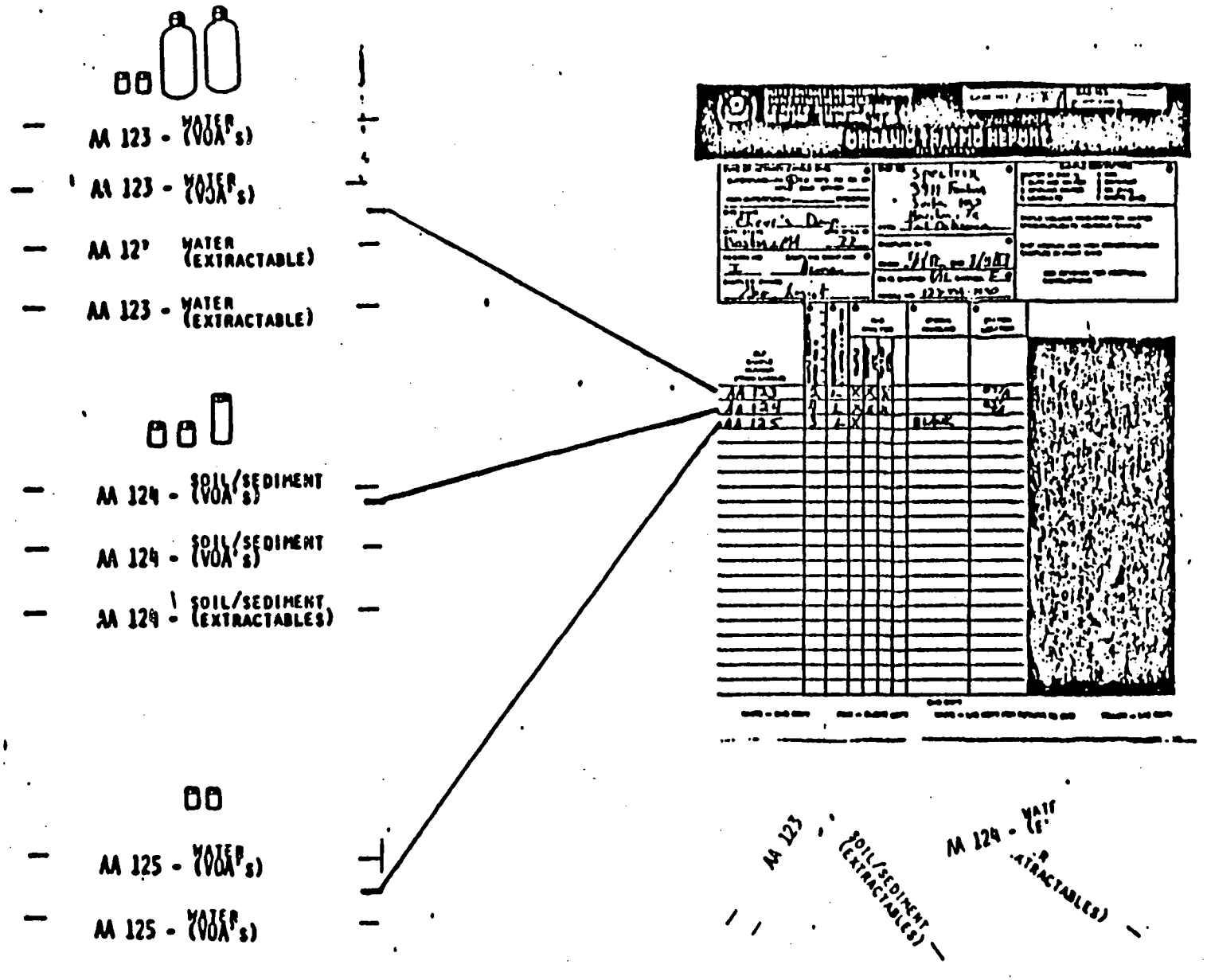
SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	SAMPLE DESCRIPTION ⑥ (FROM BOX 6) 1 2 3 4 5 6 7	CONCENTRATION ⑦ L = LOW/MED M = MED (SAS)	RAS ANALYSIS ⑧ VOLATILE	BASE/NEUT ACID	PESTICIDE /PCB'S		SPECIAL HANDLING ⑨	STATION LOCATION ⑩
AA 123	2	L	X	X	X			02/A
AA 124	4	L	X	X	X			02/A
AA 125	3	L	X				BLANK	

SMO COPY

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY



TEAR UP THE CORRESPONDING UNUSED SAMPLE LABELS

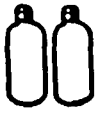
MAB 123 - TOTAL METALS

MAB 123 - CYANIDE

MAB 123 - Hex Chrome

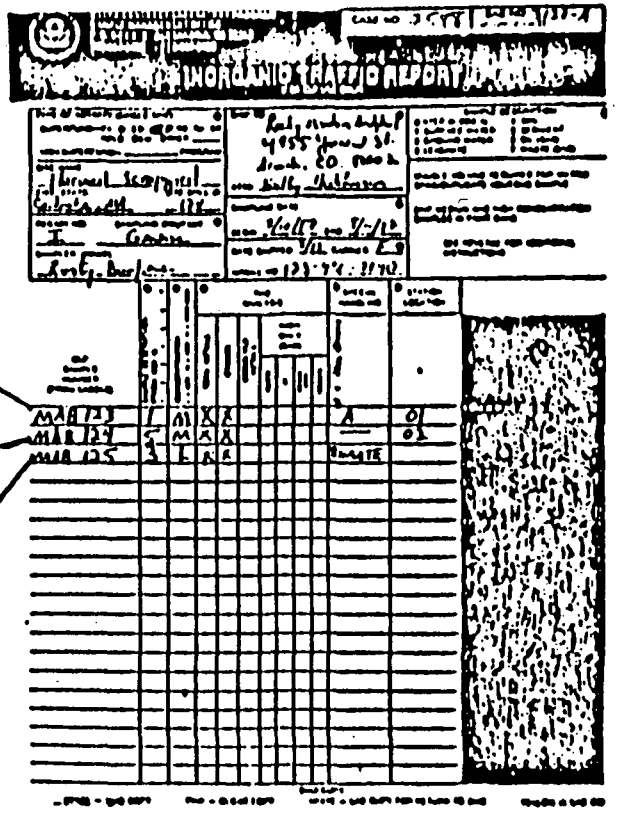
MAB 124- TOTAL METALS

MAB 124- CYANIDE



MAB 125- TOTAL METALS

MAB 125- CYANIDE



MAB 123 - CYANIDE

MAB 124- TOTAL METALS

TEAR UP THE CORRESPONDING UNUSED SAMPLE LABELS

SAMPLER INSTRUCTIONS FOR USE OF MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS HORIZONTAL FORMAT EPA FORM #9110-1 (INORGANICS) AND FORM 9110-2 (ORGANICS)

1/20/89

A. Introduction - Samples and Sample Numbers

The Contract Laboratory Program (CLP) Organic and Inorganic Multi-Sample Traffic Reports (TRs) document samples shipped to CLP laboratories. You must use TRs each time you ship Routine Analytical Services (RAS) samples to a CLP laboratory. The new horizontal version of the multi-sample TRs may document up to 20 samples shipped to one CLP laboratory under one Case Number and RAS analytical program.

CLP sample types are defined by the RAS analytical program. There are currently three organic/inorganic programs: inorganic, organic, and fast-turnaround VOAs. Inorganic samples may be analyzed for Total Metals, Cyanide or both. Organic samples may be analyzed for Volatile Organics (VOAs), Base/Neutral/Acid (BNAs), Pesticide/PCBs, or any combination of these. VOA-Only samples are in a separate program from organics because of the faster turnaround provided. Inorganic samples are documented on Inorganic TRs. Organic and VOA-Only samples are documented on Organic TRs.

A CLP sample is one matrix — water or soil — never both. The CLP sample is further defined as consisting of all the sample aliquots from one station location, for each matrix and RAS analytical program. For example, let's say you were sampling at Pond A. You plan to collect one water sample and one soil/sediment sample, each to be analyzed for VOAs, BNAs, Pesticide/PCBs, Total Metals and Cyanide. All the bottles for the organic water analyses at this station — VOA vials, BNA jars, and Pesticide/PCB jars — make up one organic CLP sample, not three. All of the bottles for the organic soil analysis — VOA vials and BNA/Pesticide/PCB jars — make up the second organic CLP sample. The bottles for inorganic water analysis at this station - one for Total Metals and one for Cyanide — make up one inorganic CLP sample, not two. The bottle for inorganic soil analysis makes up the second inorganic CLP sample from Pond A. Even though you have collected a water and a soil for five different analyses from Pond A, you've collected four CLP samples — an organic water, an organic soil, an inorganic water and an inorganic soil.

The CLP generates unique Sample Numbers which must be assigned to each organic, VOA-Only, and inorganic sample. The unique CLP Sample Numbers are printed on the adhesive labels. It is your responsibility to assign this critical Sample Number correctly and to transcribe it accurately on the TR.

If the organic sample will be split between a 14 day VOA-only lab and a RAS organic lab, two CLP sample numbers for each sample must be used. The VOA only lab sample would have one number and the ABN/Pesticides/PCBs sample fraction would be assigned another number. A good rule of thumb is one sample number per sample per lab.

Organic and VOA-Only Sample Numbers are in the format XX123, and have ten labels per strip: four for extractables, two for VOAs, and four blank (extra). (See Attachment 1.) DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see Attachment 1). Remember that the unique Sample No. must only be used once. DESTROY THE EXTRA LABELS

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are alphabetically coded to correspond with each Region as follows:

Letter Code Organic	Inorganic	Region	Letter Code Organic	Inorganic	Region
A	MA	I	F	MF	VI
B	MB	II	G	MG	VII
C	MC	III	H	MH	VIII
D	MD	IV	Y	MY	IX
E	ME	V	J	MJ	X

REMEMBER:

- TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- Organic samples, VOA-Only samples, and inorganic samples are assigned separate, unique Sample Numbers. Each sample consists of all the sample aliquots from a sample station location for analysis in one of the three analytical programs.
- A CLP RAS sample will be analyzed as either a water or a soil sample.
- Prevent accidental duplication of Sample Numbers by destroying unused labels.
- Use only the Sample Numbers specific to your Region.
- The samplers must indicate on each Traffic Report whether shipment is complete.

B. Completing the Form - Case Documentation (Attachments 2 & 3)

Enter the Case No. and SAS No. (if applicable) at the top right of the form. Complete the boxes in the header:

Box No. 1:

Type of Activity:

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

ENF	-	Enforcement	RD	-	Remedial Design
ER	-	Emergency Response (Removal)	RIFS	-	Remedial Investigation Feasibility Study
ESI	-	Expanded Site Investigation	SI	-	Site Investigation
NPLD	-	National Priorities List Delete	ST	-	State Lead
O + M	-	Operations and Maintenance	STPA	-	State Lead Assessment
PA	-	Preliminary Assessment	STSI	-	State Lead Site Investigation
RA	-	Remedial Action	Other	-	Please Specify

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA.

Enter the site name, the city, state, and Site Spill ID in the designated spaces.

Box No. 2:

Regional Information:

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

Box No. 3:

Ship To:

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

Box No. 4:

Shipping Information:

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Purolator, etc.) and the airbill number in the appropriate spaces.

C. Completing the Form - Sample Documentation (Attachments 2-3)

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through G to describe the sample:

Column A, Sample Description:

Enter the appropriate sample description code from Box 5. NOTE: Describe BLANKS as #3 "Leachate" in Column A. Write the word "Blank" in Column D, the Special Handling section. Note: Item #6 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste samples without making prior arrangements with SMO.

Column B, Concentration:

Organic - If sample is estimated to be low or medium concentration, enter "L". When shipping RAS Plus SAS high concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS Plus SAS arrangement).

REMINDER: Ship medium and high concentration organic and inorganic samples in metal cans.

Column C: RAS Analysis:

Check the analytical fractions requested on each sample.

Column D: Special Handling:

Use this space to specify any special handling requirements. Blank samples should be identified as such in this space. When shipping RAS Plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B = Cl, etc.) and enter the codes in this column.

D. Instructions on the Reverse (Attachments 4-5)

Instructions summarizing CLP sample volumes, packaging and reporting requirements are printed on the back of the TR.

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557-2490 FTS 557-2490

EPA

Organic Traffic Report
(For CLP Use Only)

Case Number: 10000
SAS No. (if applicable):

1. Type of Activity (Check one)
- [ ] ENF
- [ ] ER
- [ ] ESI
- [ ] NPLD
- [ ] O&M
- [ ] PA
- [ ] RA
- [ ] RD
- [ ] RIFS
- [x] SI
- [ ] ST
- [ ] STPA
- [ ] STSI
- [ ] Other (Specify)

Non-Superfund Program: [ ]

Site Name: Cheer's Dump

City, State: Boston MA

Site Spill ID: BB

2. Region Number: V
Sampling Co.: Acme
Sampler (Name): John Doe

3. Ship To:
ABC Labs
123 Arrow WAY
Hope VA
ATTN: Sample custodian

4. Date Shipped: 12/10/88
Airbill Number: 123-456-7890
Carrier: F

Triple volume required for matrix spike/duplicate aqueous sample.

Ship medium and high concentration samples in paint cans.

See reverse for additional instructions.

5. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Number (From labels)	(A) Sample Description (From box 5)	(B) Concentration L=low M=med H=High	(C) RAS Analysis VOA	(C) RAS Analysis BNA	(C) RAS Analysis Pest/PCB	(D) Special Handling	(E) Station Location	(F) Date/Time of Sample Collection	(G) Corresponding CLP Inorganic Sample Number
EA123	2	L	X	X	X				
EA124	4	L	X	X	X				
EA125	3	L	X			BLANK			

EPA Form 9110-2 (9-88) Replaces EPA Form 2075-7, which may be used. Blue - SMO Copy Pink - Region Copy White - Lab Copy for Return to SMO Yellow - Lab Copy

C-11

EPA

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557-2490 FTS 557-2490

Inorganic Traffic Report
(For CLP Use Only)

Case Number: 10,100 | SAS No. (if applicable):

1. Type of Activity (Check one)
☐ ENF ☐ NPLO ☐ RA ☑ SI ☐ STSI
☐ ER ☐ O&M ☐ RD ☐ ST ☐ Other (Specify)
☐ ESI ☐ PA ☐ RIFS ☐ STPA

Non-Superfund Program: ☐

2. Region Number: V | Sampling Co.: Acme

Sampler (Name): John Doe

3. Ship to:
LAB A
100 April WAY
Boston MA
ATTN: LAB CUSTODIAN

4. Date Shipped: 12/10/88 | Airbill Number: 321-687-123

Carrier: F

Double volume required for matrix spike/duplicate aqueous sample.

Ship medium and high concentration samples in paint cans.

See reverse for additional instructions.

Site Name: CHeers Dump

City, State: Boston MA | Site Spill ID: ZZ

5. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Number (From labels)	(A) Sample Description (From box 8)	(B) Concentration L=low M=med H=high	(C) RAS Analysis: Total Metals	(C) RAS Analysis: Cyanide	(D) Special Handling	(E) Station Location	(F) Date/Time of Sample Collection	(G) Corresponding Organic Sample Number
MEA 123	1	M	X	X				
MEA 124	5	M	X	X				
MEA 125	3	L	X	X	BLANK			

EPA Form 9110-1 (9-88) Replaces EPA Form 2075-6, which may be used. Green • SMO Copy Pink • Region Copy White • Lab Copy for Return to SMO Yellow • Lab Copy

C-12

CHAIN-OF-CUSTODY FORM

1. Enter your project # or the first six digits of the CRL log number (see page C-20).
2. Enter the case number or SAS number (do not enter the site name).
3. Obtain the full signature of sample team leader.
4. Enter the traffic report sample number or the SAS sample number.
5. List sampling dates for all samples.
6. List sampling times for all samples.
7. Indicate "grab","composite" sample with an "X".
8. List station locations and other information . i.e.. 'blank', use for the MS/MSD. etc.
9. Enter number of containers per sample and container volume (e.g.,2-40 ml).
10. List analyses individually. (VOA,ABN,PEST/PCB,MET,CN.etc.; for soils, metals and cyanide are taken from the same container, therefore the MET & CN should be together in one column.)
11. Construct column heading for "tag number" and list tag numbers for each sample container.
12. Obtain signature of sample team leader and carry out chain of custody procedures.
13. State carrier service and air bill number. lab service. and custody seal numbers are written here.

NOTE:
One Chain-Of-Custody should be filled out per shipping container. The purpose of using site code is to prevent the contract laboratory from obtaining the site name. An alternative to using a site code is to separate the copies and write the site name on your copy and the Region's copy, leaving that field blank on the lab's copy.

THIS IS A THREE COPY FORM:
The top copy goes to the CRL or CLP laboratory with the samples.
The second copy (pink) goes to SMO if the samples are going to the CLP.
The last copy (yellow) goes to the RSCC with other paperwork for the site (for samples shipped to the CLP).

(continued)

CHAIN OF CUSTODY FORM (continued)

If numbered COC seals are not available from Region V, then the alternate COC seal (a white seal that needs to be signed and dated upon use) should be used. In this case, a note should be made on the COC form indicating that these seals were used instead of the numbered seals.

For samples coming to the CRL for analysis, the site name should be entered. The CRL log number should be used to identify the sample (instead of the traffic report number), as well as the tag number and analyses requested.

Also, list the QC bottle lot numbers in the remarks area if you are not tracking this on your sampling matrix.

Office of Enforcement

CHAIN OF CUSTODY RECORD

Chicago, Illinois 60604

PROJ. NO. (1)	PROJECT NAME (2)
SAMPLERS: *(Signature)* (3)	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	(10)	REMARKS (11)
			(7)					
		(6)						
	(5)				(8)	(9)		
(4)								

Relinquished by: *(Signature)* (12)	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks (13)	

Distribution: White — Accompanies Shipment; Pink — Coordinator Field Files; Yellow — Laboratory File

05-01657

CENTRAL REGIONAL LABORATORY SAMPLE DATA REPORT (CRL-SDR)

1. Insert assigned laboratory case number.
2. Insert site name.
3. Insert laboratory names, indicating which lab will receive the organic samples and which lab will receive the inorganic samples.
4. Insert date of shipment.
5. Insert DU code (either TFA102 for site inspection or remedial, or TGB102 for enforcement, including PRP sites).
6. Insert name of RPM (the RPM will know what the site DU code is).
7. Enter the Cercli s number.
8. Insert page number and total number of pages.
9. Enter the site/spill ID code (a 2 digit preassigned EPA code).
10. Insert CRL log number, which consists of the fiscal year, EPA assigned contractor code, sample type designation and sample number.

Example: 8 9 Z A 0 1 S 0 1
a b c d e

a.	b.	c.	d.	e.
FY - Fed. Fiscal (Oct.-Sept.)	contractor code	this should be a sequential number i.e..01.02. 03.etc.	sample type S-sample D-duplicate R-field or trip blank	sample number

89ZA01S01 would be a sample.
89ZA01D01 would be a field duplicate of sample 89ZA01S01.
89ZA01R01 would be a field blank.

11. Insert organic traffic report number.
12. Insert inorganic traffic report number.
13. Indicate the analyses required (eg. acid-base neutral cpds., volatile organic analysis, etc.) for each sample in the appropriate section (for waters or soils) with an "X".

Note: All samples should have a unique number. If a sample is collected for filtered and unfiltered metals analyses, a separate ITR should be filled out for each bottle(the filtered and unfiltered). Each one of these samples would then be assigned a unique CRL log number. In order to distinguish between the filtered and unfiltered samples, they can be listed on the CRL-SDR with a column heading indicating 'filtered metals'.

(continued)

Central Regional Laboratory Sample Data Report (continued)

THIS IS A SINGLE COPY FORM:
This form must be filled out for all SF samples which will go to contract labs and must be sent to the Region V RSCC with the other paperwork required for a site. A copy must also be sent to SMO with the TRs and the COCs.

The contractor codes list below should be consulted when generating the CRL log number. A minimum of approximately 10,000 unique CRL log numbers can be generated for each contractor per fiscal year using this numbering system.

Contractor	Code
REM II	R
REM III	VA
REM IV	H
REM V	VB
ARCS/Other	
Warzyn	ZA
Black & Veatch	ZB
CH2	ZC
Donahue	ZD
E&E	ZE
PRC	ZF
Weston	ZG
WW Science	ZH
EPA Personnel	S
RCRA	K
TES	J
TAT	WT
FIT	F
MDNR	M
WDNR	X
MPCA	Y

ORGANICS/INORGANICS

THIS FORM IS TO BE USED FOR SAMPLES SENT TO CONTRACT ONLY

CASE NUMBER/SAS No. (1) SITE NAME (2) LABORATORY (3) DATE SHIPPED (4)

SUPERFUND DU NUMBER (5) EPA RPM or OSC (S.M.S.)/(CES) (6) Cerclis Number (7) PAGE (8) OF

SITE/SPILL ID (9)

			WATER OR LIQUIDS (13)												SEDIMENTS or SOILS											
CRL LOG NUMBER	ORGANIC TRAFFIC REPORT NUMBER or SAS Packing List No.	INORGANIC TRAFFIC REPORT NUMBER	ACID BASE NEUTRAL CPDS ORGANIC SCAN UG L TOX217574	VOLATILE ORGANIC ANALYSIS ORGANIC SCAN UG L TOX217564	WATER POLYCHLORINATED BIPHENYLS UG L PES 171[illegible]	WATER CHLORINATED PESTICIDES UG L PES17134	TOTAL METALS IN WATER UG L MET111	WATER CYANIDE UG L [illegible]	NITRATE NITRITE MG L [illegible]	AMMONIA MG L [illegible]	RESIDUE FILTERABLE TDS MG L [illegible]	RESIDUE NON-FILT TSS MG L [illegible]			ACID-BASE NEUTRAL CPDS ORGANIC SCAN MG KG TOX215[illegible]	VOLATILE ORGANIC ANALYSIS ORGANIC SCAN MG KG TOX215[illegible]	SEDIMENTS POLYCHLORINATED BIPHENYLS MG KG [illegible]	SEDIMENTS CHLORINATED PESTICIDES MG KG [illegible]	TOTAL METALS MG KG MET[illegible]	CYANIDE MG KG [illegible]	EP TOXICITY METALS MG KG	AMMONIA MG KG [illegible]				
(10)	(11)	(12)																								

Appendix D

CLP Sample Collection Requirements For Routine Water and Soil Samples for Organics and Inorganics Low, Medium and High Concentration and Dioxin Samples

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
WATER SAMPLES				
Metals-low level (Hg included)	1 liter	1	1 liter polyethylene bottle	HNO_3 to a pH<2
*Metals-medium level (Hg included)	1 liter	1	16 oz. wide wide mouth bottle	HNO_3 to a pH<2
Cyanide- low level	1 liter	1	1 liter polyethylene bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
*Cyanide-medium level	1 liter	1	1 16 oz. wide wide mouth bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
Extractables-low level	1 gallon	2	80 oz. amber glass bottles	Cool, 4° C
		or		
		4	1 liter amber glass bottles	
*Volatile-low or medium level	80 ml	2	40 ml glass vials	Cool, 4° C. Preserve low level samples with 1-2 drops HCl to pH<2. Samples must be free of headspace.
SOIL SAMPLES				
*Metals and cyanide, low or medium level	6 oz.	1	8 oz. wide mouth glass bottles	
		or		
		2	4 oz. wide mouth glass bottles	
*Extractables-low or medium level	6 oz.	1	8 oz. wide mouth glass bottles	Cool, 4° C
		or		
		2	4 oz. wide mouth glass bottles	
*Volatiles-low or medium level	240 ml	2	120 ml wide mouth glass vial	Cool, 4° C: vial must full and free of headspace

Sample collection Requirements (continued)

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
HIGH HAZARD SAMPLES				
*Liquid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	Note: One bottle is for inorganics. the other is for organics
*Solid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	(same as above)
DIOXIN SAMPLES				
*2.3.7.8-TCDD	4 oz.	1	4 oz. wide mouth glass bottle	

* All medium level. high hazard. and dioxin samples must be sealed in metal paint cans for shipment. The outer metal can must be labeled with the number of samples contained inside.

** Should only be used in the presence of residual chlorine.

All low level sample containers must be enclosed in clear plastic bags before placing in the cooler for shipment.

All samples should be shipped in ice chests packed with non-combustible, absorbent packing material (vermiculite) surrounding the plastic enclosed sample bottles (or metal cans containing samples).

Traffic Reports. Dioxin Shipment Records. SAS Packing Lists, Chain of Custody Records and any other shipping/sample documentation accompanying the shipment must be enclosed in a waterproof plastic bag and taped to the underside of the cooler lid.

Coolers must be sealed with Region V numbered custody seals in such a manner that the custody seals would be broken if the cooler were opened. Water proof tape must cover the custody seals.

Water samples for organic matrix spike/matrix spike duplicate analysis must be collected at double the volume specified for Extractables and triple the volume specified for Volatiles.

The RAS/SOWs require lab QC (MS/MSD for organics. a spike and a duplicate for inorganics) to be done at a frequency of one set of QC for each 20 samples (or less) of the same matrix in each Case. (It is important that the traffic reports contain a statement indicating whether sample shipment is complete or if more samples will be coming to the lab under that Case number so that the lab can proceed with the analyses.) If more than 20 water samples are

collected for a Case. extra volume for the MS/MSD analyses must be collected for every group of 20 organic samples or less.

For water and soil samples, field blanks and duplicates should be supplied at the frequency prescribed in the approved QAPP for the site.

No additional soil volume is required for laboratory analysis of MS/MSD (organics) or spikes and duplicates (inorganics).

The water Volatiles sample must be preserved with 4 drops of 1:1 HCl or 2 drops of concentrated HCl to a pH<2. This is due to a new CLP holding time of 10 days (instead of 7 days).

Appendix F

Residential Well Sample Collection Requirements For CRL and CLP

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
Metals	1 liter	1	1 liter polyethylene bottle	HNO_3 to a pH<2
Cyanide	1 liter	1	1 liter polyethylene bottle	NaOH to a pH>12 Cool, 4° C **Special handling if residual chlorine or sulfide is suspected
Mercury	500 ml	1	1 liter polyethylene bottle	10 ml of preservative so that final concentration is 0.05% (w/v) $K_2Cr_2O_7$ and 0.5% (w/v) HNO_3
Pest/PCB (Organics)	1 liter*	1	1 liter amber glass bottle completely full	Cool, 4° C
Acid/Base/ Neutral (organics)	1 liter*	1	1 liter amber glass bottle completely full	Cool, 4° C
Volatile Organics	120 ml	4 3	40 ml glass vials	Cool, 4 C Samples must be free of headspace.

* A total of three 1 liter bottles is required per sample if ABN and Pest/PCBs are requested. The extra bottle is used for re-extraction, if necessary.

Note: A total of 8 1 liter bottles is required for the sample chosen for the Matrix Spike and Matrix Spike Duplicate analysis of ABN and Pest/PCBs.
A total of 8 vials is required for the sample chosen for the Matrix Spike and Matrix Spike Duplicate analysis of volatiles.
No extra volume is required for the spike and duplicate analysis of metals, cyanide and mercury, however, the sampler should indicate on the sample tags which samples shoulc be used for the lab duplicate and lab spike analysis.

Mercury Preservative: Dissolve 250ml of concentrated HNO_3 and 25g of $K_2Cr_2O_7$ in deionized distilled water and dilute to one liter. Collect approximately 500ml of sample and add 10ml of this preservative.
Caution: Do not store the preservative solution in plastic containers.

COMMUNITY RELATIONS PLAN

COMMUNITY RELATIONS PLAN

SOUTHEAST ROCKFORD AREA GROUNDWATER CONTAMINATION
WINNEBAGO COUNTY, ILLINOIS

MAY 1990

PREPARED BY

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
COMMUNITY RELATIONS STAFF
IN CONJUNCTION WITH
THE DIVISION OF LAND POLLUTION CONTROL

COMMUNITY RELATIONS PLAN

SOUTHEAST ROCKFORD AREA GROUNDWATER CONTAMINATION
WINNEBAGO COUNTY, ILLINOIS

May 1990

A. OVERVIEW OF COMMUNITY RELATIONS PLAN

This community relations plan identifies issues of community concern regarding the Southeast Rockford Groundwater Contamination in Winnebago County, Illinois. The plan outlines community relations activities to be conducted during the operable unit and the Remedial Investigation and Feasibility Study (RI/FS). RI/FS is required at every site in the Superfund program. This site was added to the list of sites eligible for Superfund money in June 1989.

The IEPA has prepared this community relations plan to structure a community relations program tailored to the needs of the Southeast Rockford community. IEPA conducts community relations activities to ensure that the local public has input to decisions about Superfund actions and that the community is well informed about the progress of these actions.

Community leadership is well organized in Southeast Rockford. A community organization (Southeast Neighborhood Development) has been in existence for a number of years and exhibits experienced leadership. In addition, Ken Rock Community Center offers a wide array of services in the area, and its leadership is intensely interested in the groundwater problem and possible solutions. The alderman for the area as well as County Board Representatives have also exhibited leadership in conveying community concerns about the groundwater problem. These community leaders will be invaluable in communicating information to citizens and relaying citizen concerns to the IEPA.

In addition, local and state health officials have been sampling private wells in the area since 1984 when groundwater contamination was first detected. The Agency needs to work closely with these health officials when communicating risk of drinking well water to local residents.

These sections follow:

* Capsule Site Description
* Community Background
* Highlights of Community Relations Program
* Techniques and Timing
* List of Contacts and Interested Parties and Locations for Information Repository and Public Meeting

The information in this plan is based on discussions conducted during a February, 1989 visit to Rockford with the officials from the Regional Illinois Department of Public Health, the Winnebago County Health Department, the IEPA Regional Office in Rockford, the Rockford Water

Superintendent, two County Board representatives and residents. Information was also gathered from telephone calls to the county administrator and other residents, and meetings with community leaders in the summer and fall of 1989.

B. CAPSULE STUDY AREA DESCRIPTION

The Southeast Rockford study area, located in Winnebago County is not a "site" in the usual sense of the word as a source of contamination, but rather it is a study area where groundwater contaminated by volatile organic compounds (VOCs) from an unknown source has been detected. This study area initially was an approximately two square mile area of about 1,500 residences bounded by Harrison Avenue, 21st Street, Sawyer Road and 8th Street. Based on sampling results during a USEPA Emergency Action, the study area was expanded west to the Rock River, east to the north-south center line of Section 6 (in the vicinity of 24th Street) and south to Sandy Hollow Road. The additional area is comprised of approximately 1,300 residences. Irregular parcels are located in Winnebago County, the rest is located in the City of Rockford. Over 500 private wells are scattered throughout the area. The remainder of the residences are on public water. Not all of the private wells are contaminated.

Three elementary schools are located in the area: St. Edwards, Nashold and Rock River Schools. Three additional elementary schools are located adjacent to the site. A two block park, Ken Rock Park, is located between Reed, Bildahl, Brooke and Lapey Road and is the site of comtaminated Municipal Well #35. Ken Rock Community Center, located in a former school building on 11th Street, appears to be the center of community activity offering classes and activities for all age groups.

The area located to the north of Harrison Avenue contains a variety of industries including furniture factories, foundries, chemical companies and machining operations. Some of the buildings are now abandoned but many are still in use. A concrete lined drainage ditch runs diagonally from northeast to southwest through the site. Several residents recalled the days when common practice for industrial waste disposal included pouring liquid waste on the ground or in the concrete drainage ditch.

In 1984, the IEPA responded to a report of illegal dumping of plating waste into a dry well in the area. IEPA sample analysis of nearby private wells did not show plating waste but did show VOCs. Subsequently, the Illinois Department of Public Health and the Winnebago County Health Department conducted extensive sampling of private wells in the area and confirmed VOCs in approximately 100 of these wells. Samples from Municipal Well #35 in Ken Rock Park also showed VOCs as well as chromium and lead. This municipal well is no longer being used regularly because of the contaminants. According to the Rockford water superintendent, Well #35 can be used for short periods of time during peak demand without showing contamination. The IEPA is also investigating groundwater at Barretts Mobile Home Park and has installed three monitoring wells in the area.

According to State and City records, the municipal well and private wells draw water from sand and gravel in the Rock River Valley. Private wells

Exhibit 1
Site Map
Southeast Rockford
Winnebago County, Illinois

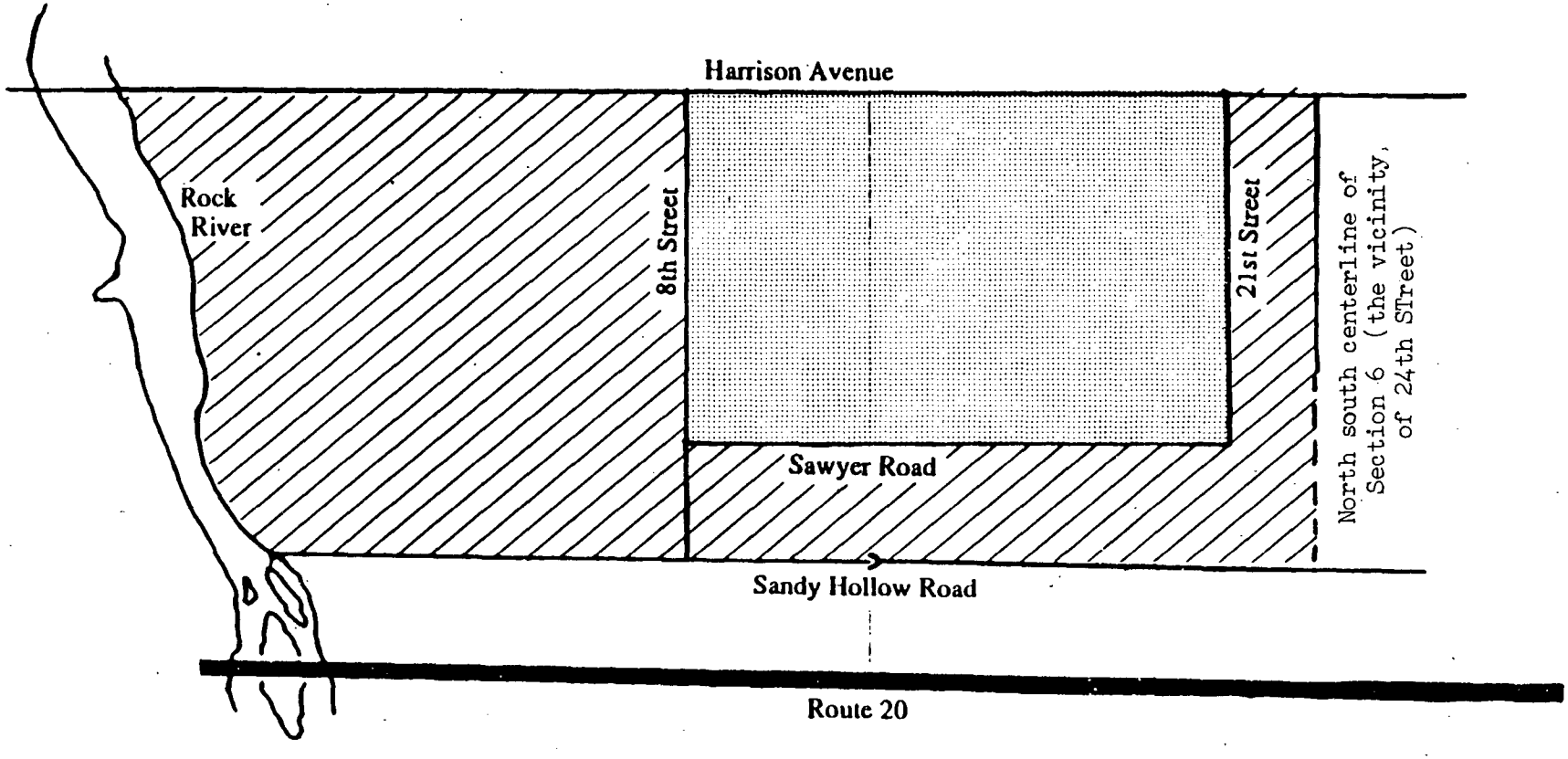
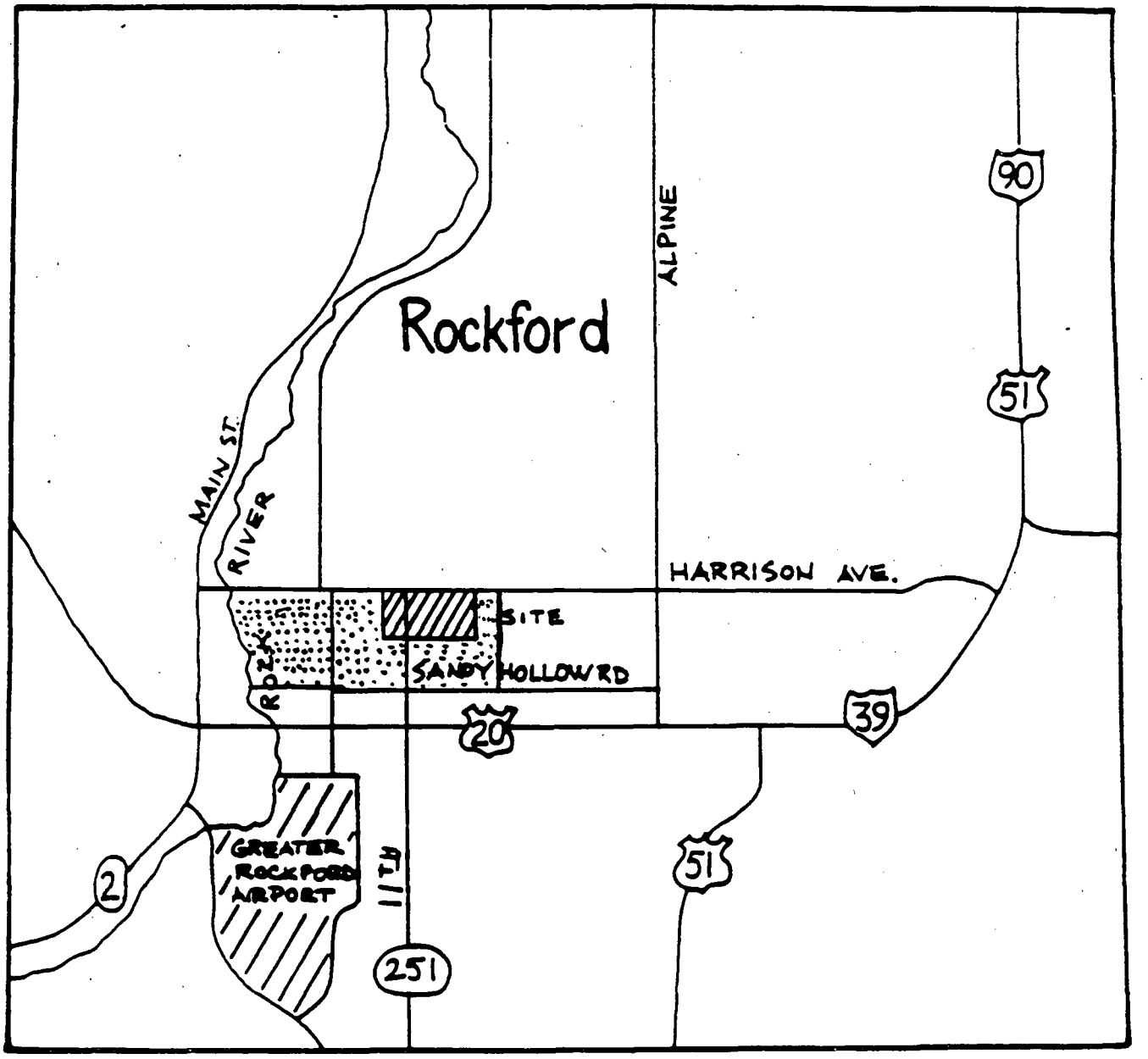


EXHIBIT 2
SITE MAP
SOUTHEAST ROCKFORD
WINNEBAGO COUNTY, ILLINOIS



are approximately 40-45 feet deep, although many private wells are sandpoints at the bottom of dug pits.

According to officials from the State Health Department Rockford Regional Office, the drought of 1988 caused some wells to go dry so residents have drilled new wells 60-65 feet deep and VOC's have been detected in these wells also. The Municipal Well #35 located in Ken Rock Park, is 214 feet deep and screened to a depth of about 150 feet according to the water superintendent.

The U. S. Environmental Protection Agency (USEPA) proposed the Southeast Rockford site for the National Priorities List in June, 1988. The site has recently been designated a State lead site for the Remedial Investigation/Feasibility Study. In the fall of 1989, the USEPA Emergency Response Branch sampled private wells and supplied bottled water and subsequently point-of-use filters to those houses with well water that posed a risk from short term exposure under USEPA guidelines. An operable unit to evaluate which houses will need to be provided alternative water to protect residents from long term health effects will be conducted by the IEPA in the spring and summer of 1990. Efforts are underway to identify potential sources of the contamination and cost recovery will be sought from these sources once they are identified by the IEPA and the USEPA.

The IEPA has lead responsibility for managing the Operable Unit and the RI/FS and its Community Relations Office will oversee community relations activities preceding and during the RI/FS, as well as, preceding and during the operable unit. The U.S. Environmental Protection Agency (USEPA) has responsibility for the Emergency Action and the USEPA will assume community relations responsibility for activities related to this action.

C. COMMUNITY BACKGROUND

1. Community Profile

The entire study area primarily is a working class community comprised of approximately 2,800 older modest homes with some apartment buildings. Barretts Mobile Home Park is located in the northeastern quadrant of the site. Both young families and a high percentage of retired people live in the area.

According to a county board member who lives in the area, a majority of families own their homes and many are second generation residents of the area. Other homes are rental properties, some reportedly owned by people who have little interest in maintenance or repair. Eleventh Street, the former Highway 51 and the present Route 251, is a commercial strip.

Residents seem to have mixed reactions to private well contamination. Several residents immediately asked for city water when they learned their wells were contaminated. One resident reported paying hookup fees to the city three years ago but receiving city water only one year ago.

Other residents, both inside and outside city boundaries, resist city water for several reasons. One citizen said she preferred well water to city water because the city water tasted of chlorine. She had been raised on well water and had moved to the area for the express purpose of being on well water. Other residents do not want to pay a monthly water bill, the hook up and meter fee of about $500, and the approximate $800 - $2000 cost of installing the water line from the street to the house.

Residents outside the city boundaries who hook up to city water must sign an agreement to annex into the city once their property is contiguous to city boundaries, and they must pay twice the rate as city residents until they are annexed. Some citizens resist annexation because of reluctance to pay city taxes and dissatisfaction with city services such as snow removal and street repair, contending that the township takes better care of the streets. On the other side of the annexation issue is the reported reluctance of the city to annex property in Southeast Rockford, because cost of services would outweigh tax income received.

Another issue is the notification of renters of houses with contaminated water. Since several landlords have a reputation for low maintenance of their property, it is questionable whether they notify new renters of the contaminated drinking water. Even though the USEPA has identified residences with water that exceeds USEPA emergency guidelines for short term exposure and is supplying them with safe water, (see Addendum on the Emergency Action) there are people drinking water that may have much lower levels of contamination but still exceed the USEPA criteria for lifetime exposure. If landlords do not notify their tenants of the contaminated well water, renters may not be aware of potential long term health problems associated with drinking their water.

2. Chronology of Community Involvement

The Winnebago Public Health Department in cooperation with the Rockford Regional Office of the Illinois Department of Public Health, the Rockford Water Superintendent and the Rockford Regional Office of the IEPA held a public meeting in 1984 to discuss contamination of private wells. Approximately 100 private well owners attended the meeting. Since then, the most concerned citizens may have hooked up to city water, installed treatment systems or moved from the area. For these people the problem may be solved, and they may have little concern about groundwater contamination. Many residents, however, are still drinking contaminated well water.

Between 1984 and 1988, Illinois Department of Public Health and IEPA staff received few inquiries from citizens, and these were usually inquiries from people who were buying or selling houses in the area. The State Department of Public Health continued to test wells on request inquiries from but received few requests until the NPL listing evidently brought the area to the attention of lenders, many of whom began refusing home mortgage loans in the study area boundaries. The inability to obtain loans for purchase or sale of

houses in the area aroused community concern manifested in a public meeting organized by Southeast Neighborhood Development (SEND), the Ken-Rock Community Center and local officials in August, 1989. In October, 1989, the IEPA in conjunction with the USEPA, the Illinois Department of Public Health, and the City of Rockford Water Department, with cooperation from local community organizations and officials, held a series of nine public meetings to explain the USEPA Emergency Action, the nature of the contamination, known risk involved with the contamination and the plan of action for protecting residents and finding the source of contamination. A total of approximately 500 people attended the October meetings.

The news media have taken a great interest in the site. The Rockford Register Star, in particular, has published a number of front page feature stories on the groundwater contamination of southeast Rockford.

3. Description of Key Community Concerns

The residents, community leaders and local officials expressed the following concerns:

- Liability. Banks, asked to finance loans, and prospective property buyers are reluctant to invest in the area fearing they may be held liable for cleanup cost of contamination. At least one vacant factory building reportedly has lost a buyer because the buyer did not want to buy property associated with the Superfund National Priorities List.

- Property Values. There may be a loss of market value for property in the area because of the groundwater contamination.

- Health. Residents being supplied filters and public water by the USEPA Emergency Response Branch may still be concerned about the long term health effects of drinking their water in the past (see Addendum on the Emergency Action). For other residents who are not eligible this year for filters and public water under the USEPA emergency action because their contaminants are at a much lower level and therefore do not meet USEPA criteria for emergency action, long term health concerns can be pressing -- especially if the residents cannot afford water treatment systems or alternative water. In addition at least one person who is drinking water that exceeds the standards set by the USEPA does not seem to fully understand the health risks associated with her water. Her water was tested in 1984 when limits had not yet been set for the contaminants found. She concluded from the studies given to her by the County Health Department that contaminants were only a problem for laboratory animals. In addition, some renters may be unaware of health hazards associated with contaminated drinking water if the landlord fails to notify them of the contamination.

- Public Water Safety. Citizens on Rockford Public Water have asked if the City water is safe. The City periodically tests

the public water for VOCs and if the water exceeds standards it is not distributed to the public.

- Spread of Contamination. Citizens on private wells, far removed from the area, have expressed concern that contamination has spread to their area and may ask that their wells be sampled.

- Loss of Municipal Wells. The City would like Municipal Well #35 returned to production. Other municipal wells have been shut down also, which may or may not be due to the contamination in this area. This loss of municipal wells for production is of concern to the city.

- Definition of Study Area Boundaries. One county board member pointed out that citizens may be misled by the term "Southeast Rockford" into thinking that this site covers the entire southeast quadrant of Rockford instead of the limited area. He suggested that all meeting notices be accompanied by a map so a larger area would not be stigmatized.

- Alternative Water Sources. Many people think that the water main should be extended to the whole contaminated area at the time (expected in summer 1990) that the USEPA extends the main to those qualified under the Emergency Action guidelines (see Addendum on Emergency Action). Since people with lower levels of contamination must wait until funding is provided in the federal budget for non-emergency action (1991 or later) they may be resentful of the delay. On the other hand, there may be a number of residents who would refuse public water even if a line were extended down their street, because they prefer well water, because they see city water as the first step toward annexation into the city, and/or because they do not want to bear the cost of hookup and future city taxes.

D. HIGHLIGHTS

The community relations program for the Southeast Rockford area is designed to allow the community to learn about and participate in the Superfund remedial process. In addition, the program will allow citizens to learn about the contaminants in their well and the hazards these contaminants may or may not pose so decisions they make about drinking the water are based on the best available information. To be effective, the community relations program must be gauged according to the community's need for information.

1. Enlist the support and participation of local officals and community leaders in coordinating community relations activities. This process has begun with meetings with County Health Department officials, Rockford Regional State Public Health Department officials, the Water Superintendent, the alderman, County Board Members as well as a telephone call to the County Administrator, meetings with community

leaders. These officials and leaders are visible and trusted leaders in the community and are therefore a valuable resource in IEPA's effort to understand and monitor community concern. These leaders will be informed regularly of site activities plans, and findings, and their comments will be considered with care.

2. Provide a clear definition of the problem. In order for people to make valuable contributions to discussions of the remedial alternative, they need a clear understanding of the problem. In this case this information will include a concise and easily understandable description of contaminants, known extent of contamination and an explanation of the hazards that may or may not exist in drinking the water. This statement will be closely coordinated with the local and regional health departments since they have already been involved in this kind of communication with the public. One health official stated that he felt many residents on private wells needed a thorough discussion of the long term health risks associated with drinking their water so that they could make informed decisions about possible water treatment or alternative sources of water. These discussions would probably be most successful in small groups or in one-to-one conversations instead of a large public meeting.

3. Survey the neighborhood for private wells. Since many of the wells reportedly are sandpoint wells or wells at the bottom of dug pits in basements, there is no complete record of the number or location of private wells. Without this information, the IEPA has no way of contacting people who may be drinking contaminated water or of sampling these wells if desired. IEPA's Community Relations staff is coordinating this survey with assistance from the Winnebago County Health Department and the Rockford Regional Office of the Illinois Department of Public Health.

4. Provide explanations of the remedial investigation and follow-up description of testing results. Concise and easily understood information will be available to all residents on the schedule, purpose, and outcome of technical activities. Where information, cannot be released to the public -- either because of quality assurance requirements or the sensitivity of enforcement proceedings -- explain clearly and simply why the information must be withheld. Community relations staff will also attempt to identify special situations or concerns where more specialized information may be required. In particular, owners and residents of property where samples are taken will receive follow-up explanations of what was done and found on their land. Additionally, to ensure that inquiries from the community are handled efficiently and consistently, a single IEPA contact, Virginia Wood, is established for this site.

5. Educate area residents and local officials about the procedures, policies and requirements of the Superfund program. The IEPA will circulate basic information about the Superfund process to the community. If potentially responsible parties become involved in the process, this explanation needs to include a clear description of the negotiation process and the limitations negotiations may place on

public release of information. In any case, residents will be informed that Superfund investigations take over a year or two and that these investigations must be completed before corrective action can be taken unless there is an emergency.

6. Enlist the cooperation of private citizens, community leaders, businesses and local governments in seeking access for monitoring well installation and private well sampling. This project will probably entail the installation of a number of monitoring wells. Since there is no identified source of groundwater contamination, monitoring wells may be installed on property owned by a number of different people. The Agency may also want access for soil and soil gas, and private well sampling. It will be essential that the Agency has the cooperation of the people in this area in order to gain access for wells and sampling. In addition long time residents can also be a useful source of information about possible sources of contamination.

E. TECHNIQUES AND TIMING

The following activities are required for the Southeast Rockford site community relations program. Exhibits 3 and 4 illustrates the timing of each activity during the remedial schedule for the site.

1. Public comment period on draft Feasibility Study (FS) reports. A feasibility study (FS) is a study of alternative remedies for a site and a description of the alternative preferred by the IEPA and the USEPA. For this project, two feasibility studies will be required: one for the operable unit and one for the overall remedial investigation (RI). The operable unit for this site is a limited action designed to identify and provide safe water to homes with well water which might pose a health threat if consumed over a lifetime. (Homes with higher concentrations of contaminations which would pose a health threat from short term consumption have already been identified by the USEPA Emergency Response Action and will be provided with public water this summer). The overall remedial investigation will be designed to accomplish several tasks including the definition of contamination extent and an identification of the source or sources of contamination. The feasibility study for the operable unit will describe methods for providing alternative water for affected homes. The feasibility study for the RI will describe alternatives for dealing with the contaminated groundwater. Both feasibility studies could include a "no action" alternative.

   A minimum 30 day public comment period must be held to allow citizens to express their opinions on the IEPA and USEPA preferred alternative for both of these actions. The IEPA should encourage community input at this point by informing citizens that the Agency will consider community opinions in the decision on remedial design and remedial action.

2. Public hearing: The IEPA will hold two public hearings. The first public hearing will be held to receive comments on the IEPA and USEPA recommendation for alternative water described in the operable unit draft feasibility study. The second public hearing will be held to

receive comments on the IEPA and USEPA recommended alternative to deal with groundwater contamination described in the draft RI/FS. These meetings might be held in the Ken Rock-Community Center. Discussion of alternatives will begin, as has been the practice at every IEPA lead Superfund site, with smaller groups before the public meetings.

3. Responsiveness summary. A Responsiveness Summary is required at the end of the public comment period for the feasibility studies for both the operable unit and the remedial investigation. This document is required as part of records of decision for the site. The responsive summaries should summarize public concerns and issues raised during the public comment periods for the operable unit and the remedial investigation. In addition, the responsiveness summaries document responses made by the IEPA and the USEPA to these concerns.

4. Revision of Community Relations Plan. After the record of decision has been signed for the operable unit, an addendum will be written to the community relations plan describing the community relations program during design and construction of the chosen method of providing alternative water.

   After the USEPA and the IEPA sign the record of decision on the chosen alternative for dealing with the groundwater contamination described in the overall RI/FS, the community relations plan will be revised. This revision will outline activities appropriate to the design and the construction of the chosen remedy for groundwater contamination (remedial design and remedial action or RD/RA). The revision of the community relations plan will:

   - Update facts and verify the information in this community relations plan prepared for the RI/FS.
   - Assess the community relations program to date and indicate if the same or different approaches will be taken during RD/RA.
   - Develop a strategy for preparing the community for a future role during RD/RA and ongoing operation and maintenance.

   The IEPA should hold community interviews before the Southeast Rockford community relations plan is revised.

5. Information repositories: The IEPA will place fact sheets, technical summaries, site reports.(including the community relations plan), and information on the Superfund program in the information repositories. An information respository will be located at the Ken Rock Community Center.

In addition to these basic requirements for a community relations program at Southeast Rockford, the IEPA will undertake a number of activities to ensure that the community is well informed about site activities and has the opportunity to express its concerns. Activities, and their approximate timing, are as follows:

1. Information contact: Virginia Wood is designated as information contact to respond directly to public inquiries regarding site activities.

2. Meetings and telephone conversations with local officials and community leaders: The Winnebago County Department of Public Health, the Rockford Regional Illinois Department of Public Health, the two County Board Members, the Rockford Water Superintendent and community leaders have indicated that they want to be informed about site plans and findings. In addition, they ask to be notified before news releases. The county officials also want to meet with project officials before public meetings. Meetings with local officials and community leaders should include both IEPA and USEPA officials and should be held at the following technical milestones:

   - Completion of final work plans;
   - Completion of the draft RI/FS reports; and
   - Before remedial action starts.

3. Informal meetings with residents: Since many people are directly affected by this site - - one meeting for the entire site would probably not be a good vehicle to answer peoples' questions about their individual wells. Two alternatives are possible. One alternative is availability sessions in which IEPA and USEPA staff are available for questions, perhaps at the Ken Rock Community Center, over a period of a day or two. Another possibility is to conduct a series of smaller meetings over a two to three day period.

   If all individual wells are sampled, the availability sessions might be conducted with members of the Health Department to aid the discussion of health effects associated with various levels of contaminants.

4. Fact sheets and technical summaries: The IEPA has prepared one background fact sheet which was distributed in October 1989. It has also prepared and mailed an update describing the private well sampling to be conducted during the operable unit. The IEPA will prepare one fact sheet at the beginning of the RI to inform area residents and other interested citizens about IEPA's site plans and the procedures of the Superfund program. The IEPA will prepare two additional fact sheets to be distributed prior to the two hearings. The first of these two will explain the results of the private well sampling conducted during the operable unit and outline each of the alternative remedies considered for the Southeast Rockford study area. A detailed description of the IEPA and USEPA preferred alternative will be provided in the Proposed Plan Summary.

   The second of these two additional fact sheets will explain the findings (including a technical summary) of the overall remedial investigation into the extent and the source of contamination and will outline each of the alternative remedies for the contaminated groundwater considered for the Southeast Rockford study area. A

detailed description of the USEPA and IEPA preferred alternative will be provided in the Proposed Plan Summary.

5. News releases to local media: The IEPA will release prepared statements to local papers, such as the Rockford Register Star and the Rockford Journal, and to local radio and television stations to announce discovery of any significant findings at the site during the Operable Unit or the remedial investigation/feasibility study, or to notify the community of any public meetings. Additional news releases are advisable at the following milestones:

   - Notification of potentially responsible parties;
   - Completion and approval of work plans;
   - Beginning of on-site investigation;
   - Completion of draft FS reports; and
   - Before the beginning of remedial action.

   Addresses and phone numbers of local media are included in the Attachment.

EXHIBIT 3

TIMING FOR OPERABLE UNIT

Community Relations Technique	Completion of the Work Plan	During Well Sampling	Completion of Well Sampling	During FS	Completion of Draft FS	Record of Decision	Start of Construction for Operable Unit
) Community Assessment	X----------Update as Needed----------						
) Information Repository	X----------Update as Needed----------						
) Naming of Information Contact	X----------Update as Needed----------						
) Meetings w/ Local Officials	X	X	X		X		X
) Well Survey & Access For Sampling	X----------X						
) Telephone Contact w/ Local Officials	X----------Provide as Needed----------						
) Informal Discussions & "Living Room" Meetings w/ Residents	X----------X------Update as Needed----------						
) Fact Sheets/Technical Summaries/Updates	X			X	X		
) News Releases	X------Provide as Needed-------X			X		X	
0) 30 Days Public Comment Period				X----------X			
1) Public Hearing					X		
2) Responsiveness Summary					X		
3) Addendum to Community Relations Plan							X

Illinois statute requires that the public meeting held during the Feasibility Study be a hearing.

Continued on next page

EXHIBIT 4

TIMING RI/FS

Community Relations Technique	Completion of the Work Plan	During RI	Completion of RI	During FS	Completion of Draft FS	Record of Decision	Start of Remedial Action
) Community Assessment	X	----------	update as needed	----------	----------	----------	----------
) Information Repository	X	----------	update as needed	----------	----------	----------	----------
1) Naming of Information Contact	X	----------	update as needed	----------	----------	----------	----------
1) Meetings w/ Local Officials	X	X	X		X		X
1) Telephone Contact w/ Local Officials	X	----------	provide as needed	----------	----------	----------	----------
1) Informal Discussions & "Living Room" Meetings w/ Residents	X	X	X--------	update as needed	----------	----------	X
7) Fact Sheets/Technical Summaries	X	X		X			
8) News Releases	X	-------	provide as needed	------	X	X	X
9) 30 Days Public Comment Period				X	----------	X	
10) Public Hearing*					X		
11) Responsiveness Summary						X	
12) Revision of Community Relations Plan						X	

* Illinois statute requires that the public meeting held during the Feasibility Study be a hearing.

ATTACHMENT
LIST OF CONTACTS AND INTERESTED PARTIES

A. Federal Elected Officials

Address	Phone
The Honorable Alan J. Dixon U. S. Senator 316 Hart Building Washington, D. C. 20515	(202) 224-2854
The Honorable Paul Simon U. S. Senator 462 Dirksen Building Washington, D. C. 20510	(202) 224-2152
The Honorable Lynn Martin U. S. Congresswoman 416 East State Street Rockford, Illinois 61104	(815) 987-4326

B. State Elected Officials

The Honorable Joyce Holmberg Illinois State Senator 825 North Main Street Rockford, Illinois 61103	(815) 962-4445
The Honorable E. J. Giorgi Illinois State Representative 112 South 2nd Street Rockford, Illinois 61104	(815) 987-7433
The Honorable Harlan Rigney Illinois State Senator Post Office Box 691 Freeport, Illlinois 61032	(815) 233-9995
The Honorable Myron J. Olson Illinois State Representative 110 East 10th Street Dixon, Illinois 61021	(815) 288-2338

C. Local Officials

Address	Phone
Thomas Currier Winnebago County Board Chair Courthouse 400 West State Street Rockford, Illinois 61101	(815) 987-2590

Address	Phone
Donald Gasparini Winnebago County Sheriff Courthouse 400 West State Street Rockford, Illinois 61101	(815) 987-5920
Steven Chapman Winnebago County Administrator 400 West State Rockford, Illinois 61101	(815) 987-3068
Earl Null County Board Member 3114 - 16th Rockford, Illinois 61109	(815) 398-0833
Paul A. Logli Winnebago State's Attorney Courthouse 400 West State Street Rockford, Illinois 61101	(815) 987-3160
Charles Box, Mayor City of Rockford 425 East State Street Rockford, Illinois 61104-1068	(815) 987-5590
James Hughes County Board Member 2226 South 5th Street Rockford, Illinois 61104	(815) 962-4844
James Tuneberg County Board Member 3708 Oaklahoma Drive Rockford, Illinois 61108	B (815) 965-8775 H (815) 397-4178
Doris Cornelius County Board Member P.O. Box 6592 Rockford, Illinois 61125	(815) 397-6375
Leonard Jacobson Rockford Alderman 3724 Lookout Drive Rockford, Illinois 61109	(815) 874-9299
Alan Werner Public Works Director 425 East State Rockford, Illinois 61104	(815) 987-5570

Address	Phone
Sam Schmidt City Administrator City of Rockford 425 East State Street Rockford, Illinois 61104	
Robert Nimmo Rockford Water Superintendent 1111 Cedar Street Rockford, Illinois 61102	(815) 987-5700
Jim Andersen, Director Winnebago County Public Health Department 401 Division Street Rockford, Illinois 61104	(815) 962-5092
David Noel Winnebago County Planning Department 400 West State Street Rockford, Illinois 61101	(815) 987-2506
Richard Baer Rockford Township Supervisor 119 North Church Rockford, Illinois 61101	(815) 962-8855

D. U.S. EPA Region V Officials

Address	Phone
Karen Vendl, Project Manager USEPA, Region V 230 South Dearborn Chicago, Illinois 60604	(312) 353-2072
MaryAnn Croce LaFaire Community Relations Coordinator USEPA, Region V 230 South Dearborn Chicago, Illinois 60604	(312) 886-1728

E. State and Local Agenices

Address	Phone
David Dollins, Project Manager Illinois EPA 2200 Churchill Road Springfield, Illinois 62794-9276	(217) 782-6760

Address	Phone
Virginia Wood, Community Relations Coordinator Illinois EPA 2200 Churchill Road Springfield, Illinois 62794-9276	(217) 782-5562
Robert Wengrow, Manager Rockford Region Div. of Land Pollution Control Illinois EPA 4302 North Main Rockford, Illinois 61103	(815) 987-7404
Roger Ruden, Manager Clay Simonson Region 1, Ill. Dept. of Public Health 4302 North Main Street Rockford, Illinois 61103	(815) 987-7511
Al Wehrman Illinois State Water Survey 2204 Griffin Drive Champaign, Illinois 61826	(217) 333-2210

F. Community Organizations, Environmental Groups and Citizens Groups

Address	Phone
Irene Marshall, President Southeast Neighborhood Development 2838 Marshall Street Rockford, Illinois 61104	
Cherene Sweeney Executive Director Ken-Rock Community Center 3218 - 11th Street Rockford, Illinois 61104	(815) 398-8864
Betty Johnson League of Women Voters of Rockford 1907 Stratford Lane Rockford, Illinois 61107	
Tref Harnois, President Rockford Area Chamber of Commerce and The Council of 100 515 North Court Street P.O. Box 1747 Rockford, Illinois 61107	(815)987-8100 (815) 987-8122 (Fax)

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	3007 Carlson	823 Ranger	606 New Milford	2522 25th	2484 Mariposa	5002 Sherwood
	S-23	S-24	S-25	S-26	S-28	S-29
Trichloroethylene	1.37	17.5	21.7	0.45	x	x
1,1,1-Trichloroethane	x	41.3	37.2	23.8	x	x
Cis-1,2-Dichloroethylene	1.90	12.9	0.74	x	x	x
Trans-1,2-Dichloroethylene	x	x	x	x	x	x
1,2-Dichloroethane	x	1.87	x	x	x	x
1,1-Dichloroethane	x	16.3	0.87	2.91	x	x
Analytical Number	24969	24970	24972	24873	24974	24975
COM Number	3	4	5	6	7	8
Date	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90

EPA DATA

FULL VOC ANALYSIS

Source: USEPA/TAT
Year: 1989

SOUTHEAST ROCKFORD DATA SUMMARY

GC-MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples >/= MCL		Samples >/= 50% MCL		Samples >/= PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorbromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichlorethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1-Dichloroethylene	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-894								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methylene Chloride	2\2 (b)	15.5-19.5								
1,1,2,2,-Teterachloroethane	1\14	1.9								
Tetrachloroethylene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Toluene			2000**	2000						
1,1,1-Trichloroethane	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
1,1,2 Trichloroethane	3\14	1.1-2.8								
Trichloroethylene	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
Trichlorofluoromethane	1\14	3								
Vinyl Chloride			2	2						
m & p-Xylene (as m-Xylene)				10000						
0-Xylene										

* *Safe Drinking Water Act Maximum Contaminant Level (MCL)*
***Proposed MCL (May, 1989)*
****Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)*
a=Results for this chemical for two of the fourteen samples are not legible. These are not included in the tablulation of the following columns.
b=Only two samples were tested for the presence of Methylene Chloride.

EPA TAT

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

PARAMETER	UNITS	2706 Lapey S-10	2827 24th S-88	2729 Cannon S-105	2826 22nd S-5	2833 Horton S-16	2806 Sewell S-41	1724 Hamilton S-47	2004 Cannon S-54
Bromoform	µg/l	X	X	X	1.1 J	X	X	X	X
Chloromethane	µg/l	X	2.85	X	X	X	X	X	X
Chloroform	µg/l	4.1 J	5.50	3.4 J	8.30	3.7 J	3.9 J	X	X
1,1-Dichloroethane	µg/l	56.50	85.30	71.20	109.00	47.00	47.30	X	12.40
1,2-Dichloroethane	µg/l	1.9 J	2.2 J	1.5 J	4.0 J	1.3 J	1.6 J	X	X
1,1-Dichloroethylene	µg/l	31.00	42.70	29.50	43.20	28.60	26.00	X	7.70
1,2 Dichloroethylene	µg/l	33.60	96.30	37.80	158.00	20.10	22.40	X	5.70
Dichloromethane	µg/l	X	X	X	2.1 J	X	X	X	X
Methylene Chloride	µg/l								
1,1,2,2,-Tetrachloroethane	µg/l	X	X	X	1.9 J	X	X	X	X
Tetrachloroethylene	µg/l	X	6.60	X	6.70	2.6 J	2.3 J	X	X
1,1,1-Trichloroethane	µg/l	143.00	245.00	168.00	227.00	142.00	222.00	2.1 J	35.60
1,1,2 Trichloroethane	µg/l	1.1 J	1.6 J	X	2.8 J	X	X	X	X
Trichloroethylene	µg/l	58.90	104.00	44.00	67.10	59.40	40.50	X	15.50
Trichlorofluoroethane	µg/l	X	X	X	3.0 J	X	X	X	X
Analytical No.:		23544	23442	23443	22829	22830	22831	22832	22833
		1	2	3	1	2	3	4	5
		10/24/89	10/24/89	10/24/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89

PARAMETER	UNITS	1621 Alton S-73	3021 8th S-80	2825 Lapey S-85	Unknown S-27	2733 Kinsey S-11	2741 Cannon S-10
Bromoform	µg/l	X	X	X	X	X	X
Chloromethane	µg/l	X	X	X	X	X	X
Chloroform	µg/l	3.8 J	X	X	X	NL	NL
1,1-Dichloroethane	µg/l	57.00	X	1.9 J	X	213	320
1,2-Dichloroethane	µg/l	1.8 J	X	X	X	X	X
1,1-Dichloroethylene	µg/l	27.60	X	8.60	X	27.5	47.8
1,2 Dichloroethylene	µg/l	22.50	X	X	X	556	894
Dichloromethane	µg/l	X	1.8 J	X	X	X	X
Methylene Chloride	µg/l					15.5	19.5
1,1,2,2,-Tetrachloroethane	µg/l	X	X	X	X	X	X
Tetrachloroethylene	µg/l	X	X	X	X	0.77	1.32 J
1,1,1-Trichloroethane	µg/l	162.00	3.0 J	136.00	X	NL	NL
1,1,2 Trichloroethane	µg/l	X	X	X	X	X	X
Trichloroethylene	µg/l	32.70	X	18.10	X	31.8	35.4
Trichlorofluoroethane	µg/l	X	X	X	X		
Analytical No.:		22834	22835	22836	24966	>9V568	>9V567
		6	7	8	1	1	2
		10/3-5/89	10/3-5/89	10/3-5/89	12/8/89	8/10/89	8/10/89

J=Estimated Value
NL=Not Legible
X=Analyzed but not detected

IDPH 1989
DATASET #1

Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (Pre-December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	17\187										
Trichlorofluromethane	2\187	2	19								
1,1-Dichloroethene	109\187	ND	63	7	7	43	23.0%	51	27.3%	43	23.0%
1,1-Dichloroethane	115\187	2	81								
Trans-1,2-Dichloroethene	12\187	1	12								
Chloroform	24\187	1	14								
1,2-Dichloroethane	25\187	ND	16	5	5	13	7.0%	17	9.1%	13	7.0%
1,1,1-Trichloroethane	164\187	1	436	200		28	15.0%	54	28.9%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	165\187	1	122	5	5	109	58.3%	119	63.6%	109	58.3%
Benzene	1\187	7	7	5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane	16\187	2	74								
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100/5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	8\187	7	108								
Vinyl Chloride				2	2						
Tetrachloroethylene	113\187	ND	15	5**	5	9	4.8%	22	11.8%	9	4.8%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/12/89 11th (#2) 2706	11/28/89 16th 3146	12/5/89 17th 3012	11/6/89 17th 3110	8/21/89 17th 3120	11/6/89 17th 3141	10/25/89 18th 2601	10/25/89 18th 2603	10/25/89 18th 2604
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace	Trace					
Trichlorofluoromethane									
1,1-Dichloroethene	50.40		2.358		0.3		1.8		
1,1-Dichloroethane	40.60		Trace				1.8	3.2	
Trans-1,2-Dichloroethene	11.60		Trace						
Chloroform	9.60		0.542						
1,2-Dichloroethane									
1,1,1-Trichloroethane	352.60		21.762	1.871	2.7		29.4	38.9	<1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	65.70		5.001	1.014	1.5		1	1.3	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	1.60		Trace	Trace			<1	<1	

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/25/89	11/7/89	11/6/89	11/28/89	8/21/89	9/19/89	11/28/89	11/28/89	11/28/89
Parameter	18th 2606	18th 3007	18th 3035	18th 3117	18th 3146	19th 2908	19th 3019	19th 3101	19th 3114
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace						
Trichlorofluoromethane									
1,1-Dichloroethene		4.7	Trace			1.3			
1,1-Dichloroethane	1.8	11	Trace			13.7			
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		49.4	8.783	1.3		192.4	4.5		
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	<1	17.8	2.652	0.7		45.3	2.0		
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		4.5	Trace				0.6		

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/6/89	11/28/89	11/28/89	8/21/89	9/26/89	9/26/89	9/26/89	9/26/89	9/26/89
Parameter	19th 3117	19th 3120	19th 3121	19th 3129	20th 2814	20th 2822	20th 2913	20th 2923	20th 2930
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene					<1	4.0	2.19	<1	1.4
1,1-Dichloroethene					46.8	19.5	19.2	3.1	8.0
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	2.537				57.5	436	204.8	83.1	164.8
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.417	0.5			121.7	112.5	44.0	8.2	21.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				15.1	1.9	6.49	3.8	1.51

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 20th 3024	11/6/89 20th 3025	11/28/89 20th 3025	8/21/89 20th 3141	11/28/89 20th 3331	9/26/89 21st 2923	9/26/59 21st 2944	9/26/89 23rd 2912	9/26/89 23rd 2927
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene						1.3	<1	3.1	<1
1,1-Dichloroethane		2.4	2.8			2.3	6.7	34.4	5.5
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane		0.4							
1,1,1-Trichloroethane	0.6	18.0	15.4			89.3	95.3	436	68.1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.9	4.1	4.3			31.4	19.9	97.1	9.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		2.1	1.8			6.8	5.8	4.3	

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/17/89	9/26/89	11/7/89	9/19/89	12/5/89	9/19/89	9/19/89	10/25/89	11/7/89
Parameter	23rd 2929	23rd 2931	23rd 3115	8th 2922	8th 2929	8th 2940	9th 2726	9th 2905	9th 3110
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride					Trace				
Trichlorofluoromethane									
1,1-Dichloroethene	4.7	<1					1.3	0.6	
1,1-Dichloroethane	14.8	6.0			Trace		24.2		
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	32.4	82.2		9.3	2.880	8.5	217	7.9	3.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	4.7	7.0		1.0	2.601	2.0	44.2	3.2	1.7
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane				47.9		1.8	11.2		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			Trace		Trace			<1	

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/7/89	12/5/89	12/5/89	10/17/89	10/26/89	1/10/89	10/79/89	9/12/89	9/12/89
Parameter	9th 3121	9th 3214	9th 3242	Alpine N. 7004	Allon 2118	Bildahl 3242	Cannon 2801	Cannon 2802	Cannon 2810
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride		Trace	Trace						
Trichlorofluoromethane									
1,1-Dichloroethene					0.7		11.4	51.1	41.8
1,1-Dichloroethane		Trace			6.4		28.5	39.2	36.9
Trans-1,2-Dichloroethene									
Chloroform								11.2	9.5
1,2-Dichloroethane								9.0	7.2
1,1,1-Trichloroethane	3	2.550	1.755		20.4	2.5	97.5	200.0	283.2
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	2	1.663	0.586		2.7	2.0	30.5	52.7	60.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluiene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.4	Trace	Trace		1.3	<1	1.1	6.6	5.3

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	9/12/89	8/21/89	10/17/89	10/17/89	11/7/89	11/28/89	8/20/89	9/19/89	9/19/89
Parameter	Cannon 2817	Cannon 2828	Cannon 2837	Cannon 2915	Cannon 2918	Cannon 3004	Hanson 2804	Hanson 2834	Hanson 2842
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	24.7	25.0	9.4	3.4			52.5	0.7	2.9
1,1-Dichloroethane	24.0	34.0	16.3	5.8	4.8	1.5		10.2	10.9
Trans-1,2-Dichloroethene									
Chloroform	7.0	5.7							
1,2-Dichloroethane		1.8					0.9		
1,1,1-Trichloroethane	83.5	177.0	89.1	49.4	38.8	14.7	204	105.8	101
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	20.7	31.0	47.1	14.3	16.2	6.3	73.4	29.6	32.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane								3.3	2.4
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene		23.0							
Vinyl Chloride									
Tetrachloroethylene	0.8	1.2	0.7	0.5			3.3		

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/10/89 Hanson 2906	10/17/89 Hanson 2911	10/17/89 Hanson 2946	9/12/89 Hanson 2633	10/17/89 Hanson 2714	9/12/89 Hanson 2802	9/12/89 Hanson 2821	9/26/89 Hanson 2901	9/26/89 Hanson 2902
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		2.7	6.1	14.0	17.2	48.0	32.3	<1	1.0
1,1-Dichloroethane		4.7	14.4		65.4	39.6	28.2	5.4	9.0
Trans-1,2-Dichloroethene	1.0								
Chloroform									
1,2-Dichloroethane						8.4			
1,1,1-Trichloroethane	31.0	32.1	13.4	13.9	141	287.5	200.0	49.3	97.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	23.0	13.3	14.8	2.7	28.3	68.5	40.0	20.3	27.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		0.4	0.2	0.9	0.3	3.3	1.6	<1	1.0

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Hanson 2907	11/6/89 Hanson 2938	10/17/89 Horton 2717	9/12/89 Horton 2726	9/19/89 Horton 2738	9/12/89 Horton 2741	9/12/89 Horton 2742	9/12/89 Horton 2746	9/19/89 Horton 2805
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	3.7		3.6	24.8	2.4	60.2	63.4	62.6	1.5
1,1-Dichloroethane	5.8	1.8	28.3	22.8	36.5	48.1	50.5	50.6	23.9
Trans-1,2-Dichloroethene									
Chloroform				7.1		13.5	14.0	14.0	
1,2-Dichloroethane				5.6		11.6	13.2	13.6	
1,1,1-Trichloroethane	49.7	16.7	16.0	78.6	411.6	100.0	434.3	400.0	218.4
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	14.3	6.2	1.7	2.7	92.8	68.1	75.8	64.3	43.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					53.9				2.1
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene							108.4		
Vinyl Chloride									
Tetrachloroethylene	0.4		0.5			8.6	4.3	2.6	

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Horton 2811	9/12/89 Horton 2818	9/19/89 Horton 2834	9/19/89 Horton 2835	9/19/89 Horton 2838	10/17/89 Horton 2905	10/17/89 Horton 2942	11/28/89 Horton 3001	11/7/89 Horton 3133
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	26.2	29.5	2.8	1.0	1.3	9.4	4.2		
1,1-Dichloroethane	62.3	35.6	27.5	13.3	22.2	44.8	7.5	4.4	
Trans-1,2-Dichloroethene									
Chloroform		1.2							
1,2-Dichloroethane		7.4							
1,1,1-Trichloroethane	249.0	205.1	228.0	197.3	218.8	133.0	13.7	30.1	2.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	47.6	57.6	54.1	26.9	51.9	51.6	12.6	8.7	1.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane			56.1	36.7					
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	3.8	3.2				1.2	0.4	1.8	

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/28/89	10/25/89	6/20/89	9/12/89	10/17/89	9/19/89	9/19/89	10/25/89	10/17/89
Parameter	Horton 3037	Horton 2924	Kinsey 2726	Kinsey 2803	Kinsey 2806	Kinsey 2813	Kinsey 2822	Kinsey 2826	Kinsey 2829
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane		1.8						18.9	
1,1-Dichloroethene		3.2	53.9	34.3	23.5	0.9	0.8	51.9	8.3
1,1-Dichloroethane				30.9	50.2	15.1	13.8		14.7
Trans-1,2-Dichloroethene									
Chloroform				8.4					
1,2-Dichloroethane			1.0	5.2					
1,1,1-Trichloroethane	1.1	26.5	161.0	219.0	197.0	193.2	182.6	193.8	94.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.9	8.5	63.8	24.1	50.8	20.4	28.2	58.9	15.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane						20.0	4.2		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		<1	1.8	1.5	1.3			3.5	0.2

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/10/89 Kinsey 2829	9/19/89 Kinsey 2833	8/20/89 Kinsey 2909	10/17/89 Kinsey 2920	11/7/89 Kinsey 3002	9/26/89 Lapey 2746	9/12/89 Lapey 2817	9/19/89 Lapey 2838	9/26/89 Lapey 2918
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		0.8	3.5	2.3	0.9	2.7	23.6	0.5	
1,1-Dichloroethane		12.6		3.9		25.2	17.5	6.5	
Trans-1,2-Dichloroethene	3.0								
Chloroform							6.4		
1,2-Dichloroethane			0.2				2.9		
1,1,1-Trichloroethane	37.0	81.0	13.9	29.1	10.6	224.2	114.2	50.6	1.5
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	35.0	20.9	7.0	7.5	2.8	50.0	21.0	17.5	<1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			0.2	0.2		4.1			

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/7/89 Lapey 3116	11/7/89 Lapey 3117	11/7/89 Lapey 3121	11/7/89 Lapey 3125	11/7/89 Lapey 3130	11/28/89 Lindberg 2402	11/6/89 Lindberg 2407	11/28/89 Lindberg 2501	1/28/89 Lindberg 2506
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane							Trace		
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	3.0	2.7	2.7	3.8	4.5		0.634	0.8	6.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.3	1.8	1.9	2.1	2	0.6	1.609	1.4	2.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene							Trace		0.8

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	12/5/89 Lindberg 2512	11/6/89 Lindberg 2515	11/6/89 Lindberg 2518	8/20/89 Lindale 2412	6/20/89 Lindale 2424	11/6/89 Lindale 2612	10/17/89 Marshall 2845	11/7/89 Marshall 264	9/12/89 Marshall 2722
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride	Trace		Trace						
Trichlorofluoromethane									
1,1-Dichloroethene	0.786	0.595	1.184				11.9		13.3
1,1-Dichloroethane	Trace						26.9	13.4	12.4
Trans-1,2-Dichloroethene	Trace								
Chloroform									3.9
1,2-Dichloroethane									
1,1,1-Trichloroethane	5.464	3.684	11.159	1.5	2.2	1.686	93.6	157	54.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	2.856	2.223	4.232	0.7	1.3	1.269	47.9	7.7	4.1
Benzene				6.5					
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace	Trace	Trace	0.3	1.0	Trace	0.9	1.4	<1

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/28/89	11/28/89	10/17/89	8/21/89	9/19/89	9/19/89	8/21/89	9/19/89	2/7/89
Parameter	Marshall 2734	Marshall 273	Marshall 2745	Marshall 2813	Marshall 2825	Marshall 2830	Marshall 2838	Marshall 2909	Marshall 2926
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	19.2		30.0	38.0	1.6	1.1	36.0	1.2	
1,1-Dichloroethane	80.9		67.6	34.0	30.0	18.7	39.0	8.8	
Trans-1,2-Dichloroethene							1.1		2.0
Chloroform				7.0			7.0		
1,2-Dichloroethane				3.1			2.9		
1,1,1-Trichloroethane	170.5	1.8	295.0	154	246	208.4	187.0	98.1	24.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	37.5		82.9	35.0	58.2	40.1	44.0	32.6	57.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					74.0	3.2		23.1	
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene	50.6			26.0			27.0		
Vinyl Chloride									
Tetrachloroethylene		0.5	3.9	1.7					

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	10/17/89	10/17/89	10/25/89	10/25/89	2/7/89	9/12/89	9/19/89	10/25/89	8/21/89
Parameter	Marshall 2937	Marshall 2946	Marshall 3018	Marshall 3036	Marshall 3101	Potter 2700	Potter 2825	Potter 2826	Potter 2837
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	2.3	1.1	1.4	0.09		32.2	0.9	9.1	20.0
1,1-Dichloroethane	6.5	1.8	3.1	3.7		25.2	15.8	10.2	25.0
Trans-1,2-Dichloroethene						6.7			
Chloroform						6.9			4.6
1,2-Dichloroethane									1.4
1,1,1-Trichloroethane	7.0	13.8	13.1	0.5	<1	111.8	192.5	93.1	113.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	5.2	5.0	4.0	2.3	2.0	23.4	40.8	27.5	24.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane							28.0		
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									18.0
Vinyl Chloride									
Tetrachloroethylene		0.2	1.6			2.2		<1	1.2

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

	11/28/89	10/25/89	9/12/89	9/12/89	9/19/89	8/20/89	9/26/89	2/7/89	9/26/89
Parameter	Potter 2933	Sewell 2718	Sewell 2814	Sewell 2822	Sewell 2826	Sewell 2902	Sewell 2909	Sewell 2909	Sewell 2917
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		3.2	51.0	49.0	1.1	10.9			<1
1,1-Dichloroethane	2.9	27.2	55.6	54.2	18.8		6.7		4.9
Trans-1,2-Dichloroethene				2.2				2.0	
Chloroform	0.6		11.5	11.7					
1,2-Dichloroethane	0.3	15.6	9.1	9.2					
1,1,1-Trichloroethane	29.8		90.0	210.0	215.0	38.9	88.9	36.0	38.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	12.0	1.8	73.7	73.2	47.9	21.8	25.1	22.0	28.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					32.3				
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.6	0.6	5.0	6.7		0.3	1.1	1.0	

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/26/89 Sewell 2921	9/26/89 Sewell 2930	8/21/89 Sewell 2930	12/25/89 Sewell 2934	9/26/89 Sewell 2938	9/26/89 Sewell 2938	9/26/89 Sewell 2976	10/25/89 Sewell 3016	10/25/89 Sewell 3026
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	<1	<1	5.9	3.2	<1	<1			4.4
1,1-Dichloroethane	4.4	4.6	7.3	7.3	6.8	6.8	9.9		19.0
Trans-1,2-Dichloroethene			1.1						
Chloroform			2.0						
1,2-Dichloroethane			0.7						
1,1,1-Trichloroethane	107.3	111.2	28.0	48.0	82.9	82.9	102.5	<1	7.7
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	19.5	19.8	13.0	17.8	18.5	18.5	30.6		9.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene			6.9						
Vinyl Chloride									
Tetrachloroethylene	1.0	1.4	1.0	1.5	<1	<1	1.6		<1

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/25/89 Sewell 3040	11/7/89 Sewell 3136	11/7/89 Sewell 3138	11/7/89 Sewell 3142	9/12/89 Wills 1201	10/25/89 Wills 1610	11/7/89 Wills 1703	9/12/89 Wills 1920	8/21/89 WILLS 1935
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	0.9					12.8	42.8	49.2	30.0
1,1-Dichloroethane	1.5					33.6	37	39.7	55.0
Trans-1,2-Dichloroethene									1.1
Chloroform								11.8	11.0
1,2-Dichloroethane								9.8	3.4
1,1,1-Trichloroethane	8.6	3.9	3.4	3.0	1.50	133	220	260	210
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	3.4	2.3	2.1	1.8	<1	37.5	73.9	50.0	45.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									42.0
Vinyl Chloride									
Tetrachloroethylene	0.9		<1		<1	0.9	1.7	4.3	2.1

IDPH 1989 (Dataset #1)

Parameter	12/5/89 Brooke 1004	11/6/89 Brooke 1113	12/5/89 Collins 3310	11/6/89 Hamilton 1709	11/6/89 Hamilton 1717	12/6/89 Johnson 1613	12/5/89 Johnson 1638	12/5/89 Johnson 1746	12/5/89 Lyran 1738
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride	Trace		Trace		Trace		Trace	Trace	
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane	Trace		Trace						
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	1.905	2.6	2.173	1.616	1.782				
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.545	0.8	0.868	0.55	1.042				
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace		Trace	Trace	Trace		Trace	Trace	

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/6/89 Pershing 1637	12/5/89 Sandy Hllw 1734	12/5/89 Sandy Hllw 1810	12/5/89 Sandy Hllw 1812	12/5/89 Sandy Hllw 2701	10/25/89 Reed 1925	10/25/89 Reed 1930
Chloromethane							
Bromoethane							
Chloroethane							
Methylene Chloride		Trace	Trace	Trace	Trace		
Trichlorofluoromethane							
1,1-Dichloroethene						8 5	12 8
1,1-Dichloroethane		Trace				14 4	46 3
Trans-1,2-Dichloroethene							
Chloroform							
1,2-Dichloroethane							
1,1,1-Trichloroethane	4.057					92.1	93
Carbon Tetrachloride							
Bromodichloromethane							
1,2-Dichloropropane							
Trans-1,3-Dichloropropene							
Trichloroethene	2.107					35	46.6
Benzene							
Dibromochloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorbenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethenyl Benzene							
O-Xylene (1,2-Dimethylbenzene)							
m & p Xylene (as m Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethylene							
Vinyl Chloride							
Tetrachloroethylene				Trace	Trace	0.5	1 5

IDPH DECEMBER 1989
DATASET #2

Summary of Historical Sampling Results

Source: IDPH
Year: 1989 (December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	3\80										
Trichlorofluromethane											
1,1-Dichloroethene	15\80	1	30	7	7	3	3.8%	6	7.5%	3	3.8%
1,1-Dichloroethane	21\80	1	78								
Trans-1,2-Dichloroethene	10\80										
Chloroform	8\80	1	5								
1,2-Dichloroethane	12\80	1	23	5	5	1	1.3%	3	3.8%	1	1.3%
1,1,1-Trichloroethane	40\80	ND	159	200		0	0.0%	3	3.8%		
Carbon Tetrachloride	2\80	2	27	5	5	1	1.3%	1	1.3%	1	1.3%
Bromodichloromethane	1\80	2	2								
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	42\80	ND	58	5	5	9	11.3%	12	15.0%	9	11.3%
Benzene	1\80	7	7	5	5	1	1.3%	1	1.3%	1	1.3%
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene	1\80			700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	3\80	3	65								
Vinyl Chloride				2	2						
Tetrachloroethylene	39\80	ND	7	5**	5	1	1.3%	3	3.8%	1	1.3%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Bildahl 3029	12/4/89 Bildahl 3221	12/4/89 Bildahl 3237	12/12/89 Bildahl 3318	12/12/89 Bildahl 3324	12/12/89 Carlson 3006	12/4/89 Collins 3201	12/4/89 Collins 3202	12/4/89 Collins 3230
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane			0.5						
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		1.3	1.0				4.7	3.7	1.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.3	1.3	0.8			0.9	2.8	1.1	0.4
Benzene	7.1								
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene						Trace	4.8	6.5	1.5

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Collins 3234	12/12/89 Collins 3317	12/11/89 Ed Vera 3414	12/11/89 Ed Vera 3425	12/11/89 Fruitland 3090	12/12/89 Harrison 2313	12/4/89 Johnson 1631	12/11/89 Johnson 1637	12/11/89 Johnson 1641
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluromethane									
1,1-Dichloroethene						0.7			
1,1-Dichloroethane									
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		2.7				12.3			
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.6	1.1							
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluiene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.8	Trace				Trace			

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Johnson 1842	12/11/89 Johnson 1711	12/11/89 Johnson 1726	12/12/89 Kishakaukee 371	12/12/89 Lapey 3038	12/12/89 Lapey 3205	12/12/89 Lapey 3230	12/4/89 Lapey 3245	12/11/89 Lund 2426
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane				Trace	Trace				
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane				0.6	2.980	2.731		0.7	
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene				0.9	1.673	1.6			
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene				Trace	Trace	Trace			

FREQUENCY OF DETECTION–SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Lund 2517	12/11/89 Lund 2526	12/11/89 Lyran 1645	12/11/89 Lyran 1650	12/11/89 Lyran 1714	12/14/89 Main 2921	12/4/89 Marshall 2721	12/4/89 Marshall 2730	12/14/89 Marshall 2813
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene							4.6	28.6	
1,1-Dichloroethane							31.6	77.9	
Trans-1,2-Dichloroethene									
Chloroform								4.7	
1,2-Dichloroethane									
1,1,1-Trichloroethane							18.1	108.0	
Carbon Tetrachloride									
Bromodichloromethane							1.5		
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene							1.8	23.7	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene							13.5	64.5	
Vinyl Chloride									
Tetrachloroethylene						Trace			Trace

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 Marshall 3138	12/14/89 Pershing 1802	12/11/89 Sandy Hllw 1715	12/14/89 Sandy Hllw 1816	12/12/89 Sandy Hllw 2413	12/14/89 Sandy Hllw 3211	12/11/89 Southworth3433	12/4/89 7th 3133	12/4/89 7th 3209
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		1.285							
1,1-Dichloroethane		Trace							
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane		1.158							
1,1,1-Trichloroethane	2.6					1.890		1.7	2.9
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.7	2.376				0.954		0.6	0.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene		Trace							
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				Trace			0.2	3.3

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 7th 3217	12/4/89 7th 3241	12/8/89 7th 3317	12/8/89 6TH 2810	12/12/89 8th 3330	12/8/89 8th 3019	12/14/89 9th 3125	12/4/89 9th 3137	12/12/89 9th 3238
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene				2.822					
1,1-Dichloroethane				Trace					
Trans-1,2-Dichloroethene				Trace					
Chloroform				0.711					
1,2-Dichloroethane				22.525	1.311	0.607	2.388	3.9	1.7
1,1,1-Trichloroethane	1.2	0.4	1.978						
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.2		0.907	5.644			1.532	1.4	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.9	0.7	Trace	Trace		Trace	Trace	1.0	Trace

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 9th 3321	12/12/89 9th 3326	12/4/89 10th 3125	12/4/89 10th 3142	12/5/89 10th 3201	12/12/89 10th 3209	12/12/89 10th 3210	12/12/89 10th 3236	12/5/89 10th 3245
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride					Trace		Trace		Trace
Trichlorofluoromethane									
1,1-Dichloroethene					Trace		Trace		
1,1-Dichloroethane					Trace		Trace	Trace	
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane			2.8	2.8	3.374		2.567	1.693	1.597
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene				2.1	2.055		1.457	0.894	0.618
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		Trace		1.5	Trace		Trace	Trace	Trace

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 2707	12/12/89 11th 2734	12/12/89 11th 2744	12/12/89 11th 2834	12/12/89 11th 2837	12/12/89 11th 2842	12/12/89 11th 2901	12/12/89 11th 2926	12/12/89 11th 2942
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	2.490	29.998	30.03		4.767	3.584	Trace	1.027	0.956
1,1-Dichloroethane	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Trans-1,2-Dichloroethene	Trace	Trace	Trace		Trace	Trace		Trace	Trace
Chloroform		3.833	3.736	1.175	1.067	0.746	0.621		
1,2-Dichloroethane	0.504	1.612	1.646	0.522			Trace		
1,1,1-Trichloroethane	5.885	152.800	158.8	41.7	37.0	29.8	23.85	10.544	9.675
Carbon Tetrachloride	1.914	27.249							
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.614	55.400	57.7	18.584	17.182	14.810	9.293	4.397	3.582
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorbenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethenyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 3132	12/11/89 18th 3414	12/11/89 18th 3110	12/11/89 18th 3510	12/4/89 Brooke 1317	12/4/89 Kinsey 2929	12/4/89 Sewell 3133	12/4/89 20th 3110
Chloromethane								
Bromoethane								
Chloroethane								
Methylene Chloride								
Trichlorofluoromethane								
1,1-Dichloroethene								
1,1-Dichloroethane	Trace					2.1		
Trans-1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
1,1,1-Trichloroethane	3.186		2.2		3.2	11.4		2.3
Carbon Tetrachloride								
Bromodichloromethane								
1,2-Dichloropropane								
Trans-1,3-Dichloropropene								
Trichloroethene	2.087				1.0	5.0		2.9
Benzene								
Dibromochloromethane								
Bromoform								
1,1,2,2-Tetrachloroethane								
Toluene								
Chlorbenzene								
Ethyl Benzene								
Carbon Disulfide								
4-Methyl-2-Pentanone								
Ethenyl Benzene								
O-Xylene (1,2-Dimethylbenzene)								
m & p Xylene (as m Xylene)								
2-Butanone (Methyl Ethyl Ketone)								
Cis-1,2-Dichloroethylene						2.9		
Vinyl Chloride								
Tetrachloroethylene	Trace							

IDPH 1988

Summary of Historical Sampling Results

Source: IDPH
Year: 1988

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES >/= MCL		SAMPLES >/= 50% MCL		SAMPLES >/= PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluromethane											
1,1-Dichloroethene	8\17	ND	4	7	7	0	0.0%	1	5.9%	0	0.0%
1,1-Dichloroethane	8\17	ND	25								
Trans-1,2-Dichloroethene											
Chloroform	9\17	ND	7								
1,2-Dichloroethane	1\17			5	5						
1,1,1-Trichloroethane	13\17	2	140	200		0	0.0%	2	11.8%		
Carbon Tetrachloride	1\17			5	5						
Bromodichloromethane	1\17										
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	12\17	1	140	5	5	8	47.1%	10	58.8%	8	47.1%
Benzene				5	5						
Dibromochloromethane	1\17										
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorbenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	11\17	ND	14	5**	5	1	5.9%	6	35.3%	1	5.9%

*Safe Drinking Water Act Maximum Contaminant Level (MCL)
**Proposed MCL (May, 1989)
***Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)
Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.
ND=Nondetect

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/00/88 Cannon 2741	9/9/88 Cannon 2842	9/9/88 Cannon 2904	9/13/88 Hanson 2804	8/8/88 Horton 2922	10/10/88 Horton 2922	8/9/88 Horton 2926	8/9/88 Horton 3005	8/9/88 Lindberg 2413	8/9/88 Lindberg 2421
Chloromethane										
Bromoethane										
Chloroethane										
Methylene Chloride										
Trichlorofluoromethane										
1,1-Dichloroethene	2.0	1.2	1.4	3.8	1.3		1.1			
1,1-Dichloroethane	13.0	11.0	2.0	25.0	11.0		9.1			
Trans-1,2-Dichloroethene										
Chloroform	4.5		1.5	4.7	0.6	3.0	2.7	7.0		
1,2-Dichloroethane								1.7		
1,1,1-Trichloroethane	140.0	86.0	56.0	98.0	110.0	3.0	23.0	1.8	2.1	
Carbon Tetrachloride								0.9		
Bromodichloromethane								3.6		
1,2-Dichloropropane										
Trans-1,3-Dichloropropene										
Trichloroethene	140.0	40.0	6.4	68.0	51.0		12.0	2.7	1.1	0.7
Benzene										
Dibromochloromethane								7.0		
Bromoform										
1,1,2,2-Tetrachloroethane										
Toluene										
Chlorbenzene										
Ethyl Benzene										
Carbon Disulfide										
4-Methyl-2-Pentanone										
Ethenyl Benzene										
O-Xylene (1,2-Dimethylbenzene)										
m & p Xylene (as m Xylene)										
2-Butanone (Methyl Ethyl Ketone)										
Cis-1,2-Dichloroethylene										
Vinyl Chloride										
Tetrachloroethylene	4.8	0.9	0.2	3.2	2.0	Trace	2.7	2.6		

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/9/88 Lindberg 2618	8/9/89 Lund 2526	8/9/89 Ralph 7232	8/9/88 Sewell 2722	8/9/88 8th 3219	8/9/88 10th 3221	8/9/88 11th 2926
Chloromethane							
Bromoethane							
Chloroethane							
Methylene Chloride							
Trichlorofluoromethane							
1,1-Dichloroethene	0.4				0.1		0.5
1,1-Dichloroethane	1.0			0.2			8.7
Trans-1,2-Dichloroethene							
Chloroform	0.6				0.3		2.5
1,2-Dichloroethane							
1,1,1-Trichloroethane	16.0			3.2	4.8	1.7	94.0
Carbon Tetrachloride							
Bromodichloromethane							
1,2-Dichloropropane							
Trans-1,3-Dichloropropene							
Trichloroethene	6.1			0.5	2.8		20.0
Benzene							
Dibromochloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorbenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethenyl Benzene							
O-Xylene (1,2-Dimethylbenzene)							
m & p Xylene (as m Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethylene							
Vinyl Chloride							
Tetrachloroethylene	2.9				14.0	0.7	

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G101D

Matrix (soil/water): water Lab Sample ID: 200646-1

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____

Barretts Mobile Home

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	45U		P	
7440-38-2	Arsenic	1U		BH	
7440-39-3	Barium	[31]		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	5U		P	
7440-70-2	Calcium	76,300		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	39		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	25		F	
7439-95-4	Magnesium	34,900		P	
7439-96-5	Manganese	34		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2000]		P	
7782-49-2	Selenium	2U		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	32,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

RECEIVED
SEP 12 1988
IEPA-DLPC

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: 6101D

Matrix (soil/water): Water Lab Sample ID: 200066-1

Level (low/Med): _____ Date Received: 8/3/98

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/l

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0 U			
	Phenol				
	Sulfate	45,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. EPA Sample No.: G1015

Matrix (soil/water): water Lab Sample ID: 2000603-2

Level (low/Med): _____ Date Received: 8/30/99

% Solids: _____ Barretts

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	224		P	
7440-36-0	Antimony	117		P	
7440-38-2	Arsenic	10.5		BH	
7440-39-3	Barium	59		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	14.0		P	
7440-70-2	Calcium	96,100		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	77		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	24		F	
7439-95-4	Magnesium	48,900		P	
7439-96-5	Manganese	[11]		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	6		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	67,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: G1015

Matrix (soil/water): Water Lab Sample ID: 200066-2

Level (low/Med): _____ Date Received: 8/30/99

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0U			
	Phenol				
	Sulfate	54,000			
	Sulfide	1000U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G102

Matrix (soil/water): water Lab Sample ID: 200066-3

Level (low/Med): _____ Date Received: 8/30/98

% Solids: _____ Barrets

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	220		P	
7440-36-0	Antimony	70		P	
7440-38-2	Arsenic	12		BH	
7440-39-3	Barium	44		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	5		P	
7440-70-2	Calcium	81,400		P	
7440-47-3	Chromium	9U		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	57		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	.31		F	
7439-95-4	Magnesium	36,300		P	
7439-96-5	Manganese	9U		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[3200]		P	
7782-49-2	Selenium	4		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	46,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IB

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: G102

Matrix (soil/water): Water Lab Sample ID: 200066-3

Level (low/Med): _____ Date Received: 8/30/98

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/l

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0			
	Phenol				
	Sulfate	33,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: 6103

Matrix (soil/water): water Lab Sample ID: 2000 46-4

Level (low/Med): _____ Date Received: 8/30/88

% Solids: _____ Barrels

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	86		P	
7440-38-2	Arsenic	1		BH	
7440-39-3	Barium	[37]		P	
7440-41-7	Beryllium	1U		P	
7440-43-9	Cadmium	6		P	
7440-70-2	Calcium	81,800		P	
7440-47-3	Chromium	9		P	
7440-48-4	Cobalt	10U		P	
7440-50-8	Copper	53		P	
7439-89-6	Iron	50U		P	
7439-92-1	Lead	11		F	
7439-95-4	Magnesium	40,900		P	
7439-96-5	Manganese	9U		P	
7439-97-6	Mercury	0.5U		CV	
7440-02-0	Nickel	25U		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	2U		BH	
7440-22-4	Silver	7U		P	
7440-23-5	Sodium	26,000		P	
7440-28-0	Thallium	5U		F	
7440-62-2	Vanadium	15U		P	
7440-66-6	Zinc	8 U		P	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

FORM I3

INORGANIC ANALYSIS DATA SHEET
OTHER INORGANICS

Lab Name: ARDL, Inc. IEPA Sample No.: 6103

Matrix (soil/water): Water Lab Sample ID: 200066-4

Level (low/Med): _____ Date Received: 8/30/95

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	M	Q
	Cyanide	5.0 U			
	Phenol				
	Sulfate	45,000			
	Sulfide	1000 U			

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

APPENDIX B

CLP SAS REQUEST FORMS

U.S. Environmental Protection Agency
CLP Sample Management Office
P.O. Box 818, Alexandria, Virgina 22313
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES
Client Request

[X] Regional Transmittal [ ] Telephone Request

A. EPA Region/Client: Region V

B. RSCC Representative: Jan Pels

C. Telephone Number: (312) 353-2720

D. Date of Request: May 1990

E. Site Name: Southeast Rockford Operable Unit

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water and/or residential well water for Arsenic, Cadmium, Chromium and Lead using detection limits lower than SOW 7/88 (See Attachment II). Arsenic, Cadmium and Lead are to be determined by GFAA using the method of standard additions. GFAA analysis of samples free of particulates may be conducted on the undigested sample. Chromium will be determined by ICP.

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

   144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates, will be collected over a 2 week period. Samples are water samples.

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

   Superfund Remedial State Lead

4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment I)

5. Estimated date(s) and method of shipment: Daily from June 4 to June 16 - Federal Express

insuring that the Tenax is fully enclosed within the heated zone of the trap thus eliminating potential cold spots. Alternatively, silanized glass wool may be used as a spacer at the trap inlet.

6.2.4 The desorber (Figure 2) must be capable of rapidly heating the trap to 180°C either prior to or at the beginning of the flow of desorption gas. The polymer section of the trap should not be heated higher than 200°C or the life expectancy of the trap will decrease. Trap failure is characterized by a pressure drop in excess of 3 pounds per square inch across the trap during purging or by poor bromoform sensitivities. The desorber design illustrated in Fig. 2 meets these criteria.

6.3 GAS CHROMATOGRAPHY/MASS SPECTROMETER/DATA SYSTEM (GC/MS/DS)

6.3.1 The GC must be capable of temperature programming and should be equipped with variable-constant differential flow controllers so that the column flow rate will remain constant throughout desorption and temperature program operation. The column oven must be cooled to 10°C; therefore, a subambient oven controller is required. If syringe injections of BFB will be used, a split/splitless injection port is required.

6.3.2 Capillary Gas Chromatography Columns. Any gas chromatography column that meets the performance specifications of this method may be used. Separations of the calibration mixture must be equivalent or better than those described in this method. Three useful columns have been identified.

6.3.2.1 Column 1 -- 60 m x 0.75 mm ID VOCOL (Supelco, Inc.) glass wide-bore capillary with a 1.5 μm film thickness.

Column 2 -- 30 m x 0.53 mm ID DB-624 (J&W Scientific, Inc.) fused silica capillary with a 3 μm film thickness.

Column 3 -- 30 m x 0.32 mm ID DB-5 (J&W Scientific, Inc.) fused silica capillary with a 1 μm film thickness.

6.3.3 Interfaces between the GC and MS. The interface used depends on the column selected and the gas flow rate.

6.3.3.1 The wide-bore columns 1 and 2 have the capacity to accept the standard gas flows from the trap during thermal desorption, and chromatography can begin with the onset of thermal desorption. Depending on the pumping capacity of the MS, an additional interface between the end of the column and the MS may be required. An open split interface (7), an all-glass jet separator, or a cryogenic (Sect. 6.3.3.2) device

are acceptable interfaces. Any interface can be used if the performance specifications described in this method can be achieved. The end of the transfer line after the interface, or the end of the analytical column if no interface is used, should be placed within a few mm of the MS ion source.

6.3.3.2 The narrow bore column 3 cannot accept the thermal desorption gas flow, and a cryogenic interface is required. This interface (Tekmar Model 1000 or equivalent) condenses the desorbed sample components at liquid nitrogen temperature, and allows the helium gas to pass through to an exit. The condensed components are frozen in a narrow band on an uncoated fused silica precolumn. When all components have been desorbed from the trap, the interface is rapidly heated under a stream of carrier gas to transfer the analytes to the analytical column. The end of the analytical column should be placed with a few mm of the MS ion source. A potential problem with this interface is blockage of the interface by frozen water from the trap. This condition will result in a major loss in sensitivity and chromatographic resolution.

6.3.4 The mass spectrometer must be capable of electron ionization at a nominal electron energy of 70 eV.[3] The spectrometer must be capable of scanning from 35 to 260 amu with a complete scan cycle time (including scan overhead) of 2 sec or less. (Scan cycle time = Total MS data acquisition time in seconds divided by number of scans in the chromatogram). The spectrometer must produce a mass spectrum that meets all criteria in Table 3 when 25 ng or less of 4-bromofluorobenzene (BFB) is introduced into the GC. An average spectrum across the BFB GC peak may be used to test instrument performance.

6.3.5 An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored GC/MS data by recognizing a GC peak within any given retention time window, comparing the mass spectra from the GC peak with spectral data in a user-created data base, and generating a list of tentatively identified compounds with their retention times and scan numbers. The software must allow integration of the ion abundance of any specific ion between specified time or scan number limits. The software should also allow calculation of response factors as defined in Sect. 9.2.6 (or construction of a second or third order regression calibration curve), calculation of response factor statistics (mean and standard deviation), and calculation of concentrations of analytes using either the calibration curve or the equation in Sect. 12.

6.4 SYRINGE AND SYRINGE VALVES

6.4.1 Two 5-mL or 25-mL glass hypodermic syringes with Luer-Lok tip (depending on sample volume used).

6.4.2 Three 2-way syringe valves with Luer ends.

6.4.3 One 25-μL micro syringe with a 2 in x 0.006 in ID, 22° bevel needle (Hamilton #702N or equivalent).

6.4.4 Micro syringes - 10, 100 μL.

6.4.5 Syringes - 0.5, 1.0, and 5-mL, gas tight with shut-off valve.

6.5 MISCELLANEOUS

6.5.1 Standard solution storage containers -- 15-mL bottles with PTFE-lined screw caps.

7. REAGENTS AND CONSUMABLE MATERIALS

7.1 TRAP PACKING MATERIALS

7.1.1 2,6-Diphenylene oxide polymer, 60/80 mesh, chromatographic grade (Tenax GC or equivalent).

7.1.2 Methyl silicone packing (optional) -- OV-1 (3%) on Chromosorb W, 60/80 mesh, or equivalent.

7.1.3 Silica gel -- 35/60 mesh, Davison, grade 15 or equivalent.

7.1.4 Coconut charcoal -- Prepare from Barnebey Cheney, CA-580-26 lot #M-2649 by crushing through 26 mesh screen.

7.2 REAGENTS

7.2.1 Methanol -- Demonstrated to be free of analytes.

7.2.2 Reagent water -- Prepare reagent water by passing tap water through a filter bed containing about 0.5 kg of activated carbon, by using a water purification system, or by boiling distilled water for 15 min followed by a 1-h purge with inert gas while the water temperature is held at 90°C. Store in clean, narrow-mouth bottles with PTFE-lined septa and screw caps.

7.2.3 Hydrochloric acid (1+1) -- Carefully add measured volume of conc. HCl to equal volume of reagent water.

7.2.4 Vinyl chloride -- Certified mixtures of vinyl chloride in nitrogen and pure vinyl chloride are available from several

sources (for example, Matheson, Ideal Gas Products, and Scott Gases).

7.2.5 Ascorbic acid -- ACS reagent grade, granular.

7.3 STOCK STANDARD SOLUTIONS -- These solutions may be purchased as certified solutions or prepared from pure standard materials using the following procedures. One of these solutions is required for every analyte of concern, every surrogate, and the internal standard. A useful working concentration is about 1-5 mg/mL.

7.3.1 Place about 9.8 mL of methanol into a 10-mL ground-glass stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min or until all alcohol-wetted surfaces have dried and weigh to the nearest 0.1 mg.

7.3.2 If the analyte is a liquid at room temperature, use a 100-µL syringe and immediately add two or more drops of reference standard to the flask. Be sure that the reference standard falls directly into the alcohol without contacting the neck of the flask. If the analyte is a gas at room temperature, fill a 5-mL valved gas-tight syringe with the standard to the 5.0-mL mark, lower the needle to 5 mm above the methanol meniscus, and slowly inject the standard into the neck area of the flask. The gas will rapidly dissolve in the methanol.

7.3.3 Reweigh, dilute to volume, stopper, then mix by inverting the flask several times. Calculate the concentration in µg/µL from the net gain in weight. When compound purity is certified at 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard.

7.3.4 Store stock standard solutions in 15-mL bottles equipped with PTFE-lined screw caps. Methanol solutions prepared from liquid analytes are stable for at least 4 weeks when stored at 4°C. Methanol solutions prepared from gaseous analytes are not stable for more than 1 week when stored at <0°C; at room temperature, they must be discarded after 1 day.

7.4 PRIMARY DILUTION STANDARDS -- Use stock standard solutions to prepare primary dilution standard solutions that contain all the analytes of concern and the surrogates (but not the internal standard!) in methanol. The primary dilution standards should be prepared at concentrations that can be easily diluted to prepare aqueous calibration solutions that will bracket the working concentration range. Store the primary dilution standard solutions with minimal headspace and check frequently for signs of deterioration or evaporation, especially just before preparing calibration solutions. Storage times described for stock standard solutions in Sect. 7.4.4 also apply to primary dilution standard solutions.

7.5 FORTIFICATION SOLUTIONS FOR INTERNAL STANDARD AND SURROGATES

7.5.1 A solution containing the internal standard and the surrogates is required to prepare laboratory reagent blanks (also used as a laboratory performance check solution), and to fortify each sample. Prepare a fortification solution containing fluorobenzene (internal standard), 1,2- dichlorobenzene-d_4 (surrogate), and BFB (surrogate) in methanol at concentrations of 5 µg/mL of each. A 5-µL aliquot of this solution added to a 25-mL water sample volume gives concentrations of 1 µg/L of each. A 5-µL aliquot of this solution added to a 5-mL water sample volume gives a concentration of 5 µg/L of each). Additional internal standrds and surrogate analytes are optional.

7.5.2 A solution of the internal standard alone is required to prepare calibration standards and laboratory fortified blanks. The internal standard should be in methanol at a concentration of 5 µg/mL.

7.6 PREPARATION OF LABORATORY REAGENT BLANK -- Fill a 25-mL (or 5-mL) syringe with reagent water and adjust to the mark (no air bubbles). Inject 10 µL of the fortification solution containing the internal standard and surrogates through the Luer Lok valve into the reagent water. Transfer the LRB to the purging device. See Sect. 11.1.2.

7.7 PREPARATION OF LABORATORY FORTIFIED BLANK -- Prepare this exactly like a calibration standard (Sect. 7.8). This is a calibration standard that is treated as a sample.

7.8 PREPARATION OF CALIBRATION STANDARDS

7.8.1 The number of calibration solutions (CALs) needed depends on the calibration range desired. A minimum of three CAL solutions is required to calibrate a range of a factor of 20 in concentration. For a factor of 50, use at least four standards, and for a factor of 100 at least five standards. One calibration standard should contain each analyte of concern and each surrogate at a concentration of 2-10 times the method detection limit (Tables 4-6) for that compound. The other CAL standards should contain each analyte of concern and each surrogate at concentrations that define the range of the method. Every CAL solution contains the internal standard at the same concentration (5 µg/L suggested for a 5-mL sample; 1 µg/L for a 25-mL sample).

7.8.2 To prepare a calibration standard, add an appropriate volume of a primary dilution standard (containing analytes and surrogates) to an aliquot of reagent water in a volumetric flask. Use a microsyringe and rapidly inject the methanol solutions into the expanded area of the filled volumetric flask. Remove the needle as quickly as possible after injection. Mix by inverting the

flask three times only. Discard the contents contained in the neck of the flask. Aqueous standards are not stable in a volumetric flask and should be discarded after 1 hr unless transferred to a sample bottle and sealed immediately.

8. SAMPLE COLLECTION, PRESERVATION, AND STORAGE

8.1 SAMPLE COLLECTION, DECHLORINATION, AND PRESERVATION

8.1.1 Collect all samples in duplicate. If samples contain residual chlorine, and measurements of the concentrations of disinfection by-products (trihalomethanes, etc.) at the time of sample collection are desired, add about 25 mg of ascorbic acid to the sample bottle before filling. Fill sample bottles to overflowing, but take care not to flush out the rapidly dissolving ascorbic acid. No air bubbles should pass through the sample as the bottle is filled, or be trapped in the sample when the bottle is sealed. Adjust the pH of the duplicate samples to <2 by carefully adding one drop of 1:1 HCl for each 20 mL of sample volume. Seal the sample bottles, PFTE-face down, and shake vigorously for 1 min.

8.1.2 When sampling from a water tap, open the tap and allow the system to flush until the water temperature has stabilized (usually about 10 min). Adjust the flow to about 500 mL/min and collect duplicate samples from the flowing stream.

8.1.3 When sampling from an open body of water, fill a 1-quart wide-mouth bottle or 1-liter beaker with sample from a representative area, and carefully fill duplicate sample bottles from the 1-quart container.

8.1.4 The samples must be chilled to 4°C on the day of collection and maintained at that temperature until analysis. Field samples that will not be received at the laboratory on the day of collection must be packaged for shipment with sufficient ice to ensure that they will be at 4°C on arrival at the laboratory.

8.2 SAMPLE STORAGE

8.2.1 Store samples at 4°C until analysis. The sample storage area must be free of organic solvent vapors.

8.2.2 Analyze all samples within 14 days of collection. Samples not analyzed within this period must be discarded and replaced.

8.3 FIELD REAGENT BLANKS

8.3.1 Duplicate field reagent blanks must be handled along with each sample set, which is composed of the samples collected from the same general sample site at approximately the same time. At the laboratory, fill field blank sample bottles with reagent

water, seal, and ship to the sampling site along with empty sample bottles and back to the laboratory with filled sample bottles. Wherever a set of samples is shipped and stored, it is accompanied by appropriate blanks.

8.3.2 Use the same procedures used for samples to add ascorbic acid and HCl to blanks (Sect. 8.1.1).

9. CALIBRATION

9.1 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed and is required intermittently throughout sample analysis as dictated by results of continuing calibration checks. After initial calibration is successful, a continuing calibration check is required at the beginning of each 8 hr. period during which analyses are performed. Additional periodic calibration checks are good laboratory practice.

9.2 Initial calibration

9.2.1 Calibrate the mass and abundance scales of the MS with calibration compounds and procedures prescribed by the manufacturer with any modifications necessary to meet the requirements in Sect. 9.2.2.

9.2.2 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire mass spectra for m/z 35-260 at 70 eV (nominal). Use the purging procedure and/or GC conditions given in Sect. 11. If the spectrum does not meet all criteria in Table 2, the MS must be retuned and adjusted to meet all criteria before proceeding with calibration. An average spectrum across the GC peak may be used to evaluate the performance of the system.

9.2.3 Purge a medium CAL solution, for example 10-20 µg/L, using the procedure given in Sect. 11.

9.2.4 Performance criteria for the medium calibration. Examine the stored GC/MS data with the data system software. Figure 3 shows an acceptable total ion chromatogram.

9.2.4.1 GC performance. Good column performance will produce symmetrical peaks with minimum tailing for most compounds. If peaks are broad, or sensitivity poor, see Sect. 9.3.6 for some possible remedial actions.

9.2.4.2 MS sensitivity. The GC/MS/DS peak identification software should be able to recognize a GC peak in the appropriate retention time window for each of the compounds in calibration solution, and make correct tentative identifications. If fewer than 99% of the

compounds are recognized, system maintenance is required. See Sect. 9.3.6.

9.2.5 If all performance criteria are met, purge an aliquot of each of the other CAL solutions using the same GC/MS conditions.

9.2.6 Calculate a response factor (RF) for each analyte, surrogate, and isomer pair for each CAL solution using the internal standard fluorobenzene. Table 1 contains suggested quantitation ions for all compounds. This calculation is supported in acceptable GC/MS data system software (Sect. 6.3.4), and many other software programs. RF is a unitless number, but units used to express quantities of analyte and internal standard must be equivalent.

$$RF = \frac{(A_x)(Q_{is})}{(A_{is})(Q_x)}$$

where: A_x = integrated abundance of the quantitation ion of the analyte.
A_{is} = integrated abundance of the quantitation ion of the internal standard.
Q_x = quantity of analyte purged in ng or concentration units.
Q_{is} = quantity of internal standard purged in ng or concentration units.

9.2.6.1 For each analyte and surrogate, calculate the mean RF from the analyses of the CAL solutions. Calculate the standard deviation (SD) and the relative standard deviation (RSD) from each mean: RSD = 100 (SD/M). If the RSD of any analyte or surrogate mean RF exceeds 20%, either analyze additional aliquots of appropriate CAL solutions to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance. See Sect. 9.2.7.

9.2.7 As an alternative to calculating mean response factors and applying the RSD test, use the GC/MS data system software or other available software to generate a second or third order regression calibration curve.

9.3 Continuing calibration check. Verify the MS tune and initial calibration at the beginning of each 8-hr work shift during which analyses are performed using the following procedure.

9.3.1 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire a mass spectrum that includes data for m/z 35-260. If the spectrum does not meet all criteria (Table 2), the MS must be

retuned and adjusted to meet all criteria before proceeding with the continuing calibration check.

9.3.2 Purge a medium concentration CAL solution and analyze with the same conditions used during the initial calibration.

9.3.3 Demonstrate acceptable performance for the criteria shown in Sect. 9.2.4.

9.3.4 Determine that the absolute areas of the quantitation ions of the internal standard and surrogates have not decreased by more than 30% from the areas measured in the most recent continuing calibration check, or by more than 50% from the areas measured during initial calibration. If these areas have decreased by more than these amounts, adjustments must be made to restore system sensitivity. These adjustments may require cleaning of the MS ion source, or other maintenance as indicated in Sect. 9.3.6, and recalibration. Control charts are useful aids in documenting system sensitivity changes.

9.3.5 Calculate the RF for each analyte and surrogate from the data measured in the continuing calibration check. The RF for each analyte and surrogate must be within 30% of the mean value measured in the initial calibration. Alternatively, if a second or third order regression is used, the point from the continuing calibration check for each analyte and surrogate must fall, within the analyst's judgement, on the curve from the initial calibration. If these conditions do not exist, remedial action must be taken which may require re-initial calibration.

9.3.6 Some possible remedial actions. Major maintenance such as cleaning an ion source, cleaning quadrupole rods, etc. require returning to the initial calibration step.

9.3.6.1 Check and adjust GC and/or MS operating conditions; check the MS resolution, and calibrate the mass scale.

9.3.6.2 Clean or replace the splitless injection liner; silanize a new injection liner.

9.3.6.3 Flush the GC column with solvent according to manufacturer's instructions.

9.3.6.4 Break off a short portion (about 1 meter) of the column from the end near the injector; or replace GC column. This action will cause a change in retention times.

9.3.6.5 Prepare fresh CAL solutions, and repeat the initial calibration step.

9.3.6.6 Clean the MS ion source and rods (if a quadrupole).

9.3.6.7 Replace any components that allow analytes to come into contact with hot metal surfaces.

9.3.6.8 Replace the MS electron multiplier, or any other faulty components.

9.4 Optional calibration for vinyl chloride using a certified gaseous mixture of vinyl chloride in nitrogen can be accomplished by the following steps.

9.4.1 Fill the purging device with 25.0 mL (or 5-mL) of reagent water or aqueous calibration standard.

9.4.2 Start to purge the aqueous mixture. Inject a known volume (between 100 and 2000 µL) of the calibration gas (at room temperature) directly into the purging device with a gas tight syringe. Slowly inject the gaseous sample through a septum seal at the top of the purging device at 2000 µL/min. If the injection of the standard is made through the aqueous sample inlet port, flush the dead volume with several mL of room air or carrier gas. Inject the gaseous standard before 5 min of the 11-min purge time have elapsed.

9.4.3 Determine the aqueous equivalent concentration of vinyl chloride standard, in µg/L, injected with the equation:

$$S = 0.102\ (C)(V)$$

where S = Aqueous equivalent concentration of vinyl chloride standard in µg/L;
C = Concentration of gaseous standard in ppm (v/v);
V = Volume of standard injected in milliliters.

10. QUALITY CONTROL

10.1 Quality control (QC) requirements are the initial demonstration of laboratory capability followed by regular analyses of laboratory reagent blanks, field reagent blanks, and laboratory fortified blanks. The laboratory must maintain records to document the quality of the data generated. Additional quality control practices are recommended.

10.2 Initial demonstration of low system background. Before any samples are analyzed, it must be demonstrated that a laboratory reagent blank (LRB) is reasonably free of contamination that would prevent the determination of any analyte of concern. Sources of background contamination are glassware, purge gas, sorbants, and equipment. Background contamination must be reduced to an acceptable level before proceeding with the next section. In general, background from method analytes should be below the method detection limit.

10.3 Initial demonstration of laboratory accuracy and precision. Analyze five to seven replicates of a laboratory fortified blank containing each analyte of concern at a concentration in the range of 0.2-5 µg/L (see regulations and maximum contaminant levels for guidance on appropriate concentrations).

10.3.1 Prepare each replicate by adding an appropriate aliquot of a quality control sample to reagent water. If a quality control sample containing the method analytes is not available, a primary dilution standard made from a source of reagents different than those used to prepare the calibration standards may be used. Also add the appropriate amounts of internal standard and surrogates if they are being used. Analyze each replicate according to the procedures described in Section 11, and on a schedule that results in the analyses of all replicates over a period of several days.

10.3.2 Calculate the measured concentration of each analyte in each replicate, the mean concentration of each analyte in all replicates, and mean accuracy (as mean percentage of true value) for each analyte, and the precision (as relative standard deviation, RSD) of the measurements for each analyte. Calculate the MDL of each analyte using the procedures described in Sect. 13.2 (2).

10.3.3 For each analyte and surrogate, the mean accuracy, expressed as a percentage of the true value, should be 80-120% and the RSD should be <20%. Some analytes, particularly the early eluting gases and late eluting higher molecular weight compounds, are measured with less accuracy and precision than other analytes. The method detection limits must be sufficient to detect analytes at the required levels. If these criteria are not met for an analyte, take remedial action and repeat the measurements for that analyte to demonstrate acceptable performance before samples are analyzed.

10.3.4 Develop and maintain a system of control charts to plot the precision and accuracy of analyte and surrogate measurements as a function of time. Charting of surrogate recoveries is an especially valuable activity since these are present in every sample and the analytical results will form a significant record of data quality.

10.4 Monitor the integrated areas of the quantitation ions of the internal standards and surrogates in continuing calibration checks. These should remain reasonably constant over time. A drift of more than 50% in any area is indicative of a loss in sensitivity, and the problem must be found and corrected. These integrated areas should also be reasonably constant in laboratory fortified blanks and samples.

10.5 Laboratory reagent blanks. With each batch of samples processed as a group within a work shift, analyze a laboratory reagent blank to determine the background system contamination. A FRB (Sect. 10.7) may be used in place of a LRB.

10.6 With each batch of samples processed as a group within a work shift, analyze a single laboratory fortified blank (LFB) containing each analyte of concern at a concentration as determined in 10.3. If more than 20 samples are included in a batch, analyze one LFB for every 20 samples. Use the procedures described in 10.3.3 to evaluate the accuracy of the measurements, and to estimate whether the method detection limits can be obtained. If acceptable accuracy and method detection limits cannot be achieved, the problem must be located and corrected before further samples are analyzed. Add these results to the on-going control charts to document data quality.

10.7 With each set of field samples a field reagent blank (FRB) should be analyzed. The results of these analyses will help define contamination resulting from field sampling and transportation activities. If the FRB shows unacceptable contamination, a LRB must be measured to define the source of the impurities.

10.8 At least quarterly, replicates of laboratory fortified blanks should be analyzed to determine the precision of the laboratory measurements. Add these results to the on-going control charts to document data quality.

10.9 At least quarterly, analyze a quality control sample (QCS) from an external source. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem source.

10.10 Sample matrix effects have not been observed when this method is used with distilled water, reagent water, drinking water, and ground water. Therefore, analysis of a laboratory fortified sample matrix (LFM) is not required. It is recommended that sample matrix effects be evaluated at least quarterly using the QCS described in 10.9.

10.11 Numerous other quality control measures are incorporated into other parts of this procedure, and serve to alert the analyst to potential problems.

11. PROCEDURE

11.1 SAMPLE INTRODUCTION AND PURGING

11.1.1 This method is designed for a 25-mL sample volume, but a smaller (5 mL) sample volume is recommended if the GC/MS system has adequate sensitivity to achieve the required method detection limits. Adjust the purge gas (nitrogen or helium) flow rate to 40 mL/min. Attach the trap inlet to the

purging device and open the syringe valve on the purging device.

11.1.2 Remove the plungers from two 25-mL (or 5-mL depending on sample size) syringes and attach a closed syringe valve to each. Warm the sample to room temperature, open the sample bottle, and carefully pour the sample into one of the syringe barrels to just short of overflowing. Replace the syringe plunger, invert the syringe, and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 25.0-mL (or 5-mL). For samples and blanks, add 5-µL of the fortification solution containing the internal standard and the surrogates to the sample through the syringe valve. For calibration standards and laboratory fortified blanks, add 5-µL of the fortification solution containing the internal standard only. Close the valve. Fill the second syringe in an identical manner from the same sample bottle. Reserve this second syringe for a reanalysis if necessary.

11.1.3 Attach the sample syringe valve to the syringe valve on the purging device. Be sure that the trap is cooler than 25°C, then open the sample syringe valve and inject the sample into the purging chamber. Close both valves and initiate purging. Purge the sample for 11.0 min at ambient temperature.

11.2 SAMPLE DESORPTION

11.2.1 Non-cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode and preheat the trap to 180°C without a flow of desorption gas. Then simultaneously start the flow of desorption gas at 15-mL/min for about 4 min, begin the temperature program of the gas chromatograph, and start data acquisition.

11.2.2 Cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode, make sure the cryogenic interface is a -150°C or lower, and rapidly heat the trap to 180°C while backflushing with an inert gas at 4 mL/min for about 5 min. At the end of the 5 min desorption cycle, rapidly heat the cryogenic trap to 250°C, and simultaneously begin the temperature program of the gas chromatograph, and start data acquisition.

11.2.3 While the trapped components are being introduced into the gas chromatograph (or cryogenic interface), empty the purging device using the sample syringe and wash the chamber with two 25-mL flushes of reagent water. After the purging device has been emptied, leave syringe valve open to allow the purge gas to vent through the sample introduction needle.

11.3 GAS CHROMATOGRAPHY/MASS SPECTROMETRY -- Acquire and store data over the mass range 35-260 with a total cycle time (including scan overhead time) of 2 sec or less. Cycle time must be adjusted to measure five or more spectra during the elution of each GC peak. Several alternative temperature programs can be used.

11.3.1 Single ramp linear temperature program for wide bore columns 1 and 2 with a jet separator. Adjust the helium carrier gas flow rate to about 15 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of desorption, then programmed to 160°C at 6°C/min, and held until all components have eluted.

11.3.2 Multi-ramp linear temperature program for wide bore column 2 with the open split interface. Adjust the helium carrier gas flow rate to about 4.6 mL/min. The column temperature is reduced 10°C and held for 6 min from the beginning of desorption, then heated to 70°C at 10°/min, heated to 120°C at 5°/min, heated to 180° at 8°/min, and held at 180° until all compounds have eluted.

11.3.3 Single ramp linear temperature program for narrow bore column 3 with a cryogenic interface. Adjust the helium carrier gas flow rate to about 4 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of vaporization from the cryogenic trap, programmed at 6°C/min for 10 min, then 15°C/min for 5 min to 145°C, and held until all components have eluted.

11.4 TRAP RECONDITIONING -- After desorbing the sample for 4 min, recondition the trap by returning the purge and trap system to the purge mode. Wait 15 sec, then close the syringe valve on the purging device to begin gas flow through the trap. Maintain the trap temperature at 180°C. After approximately 7 min, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When the trap is cool, the next sample can be analyzed.

11.5 TERMINATION OF DATA ACQUISITION -- When all the sample components have eluted from the GC, terminate MS data acquisition. Use appropriate data output software to display full range mass spectra and appropriate plots of ion abundance as a function of time. If any ion abundance exceeds the system working range, dilute the sample aliquot in the second syringe with reagent water and analyze the diluted aliquot.

11.6 IDENTIFICATION OF ANALYTES -- Identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in the user-created data base. The GC retention time of the sample component should be within three standard deviations of the mean retention time of the compound in the calibration mixture.

11.6.1 In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and should agree within absolute 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10 to 50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.

11.6.2 Identification requires expert judgement when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components. When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. Because purgeable organic compounds are relatively small molecules and produce comparatively simple mass spectra, this is not a significant problem for most method analytes.

11.6.3 Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks. Otherwise, structural isomers are identified as isomeric pairs. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary columns. If unresolved, these groups of isomers must be reported as isomeric pairs.

11.6.4 Methylene chloride and other background components appear in variable quantities in laboratory and field reagent blanks, and generally cannot be accurately measured. Subtraction of the concentration in the blank from the concentration in the sample is not acceptable because the concentration of the background in the blank is highly variable.

12. CALCULATIONS

12.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations if unique ions with adequate intensities are available for quantitation.

12.1.1 Calculate analyte and surrogate concentrations.

$$C_x = \frac{(A_x)(Q_{is})\ 1000}{(A_{is})\ RF\ V}$$

where: C_x = concentration of analyte or surrogate in µg/L in the water sample.
A_x = integrated abundance of the quantitation ion of the analyte in the sample.
A_{is} = integrated abundance of the quantitation ion of the internal standard in the sample.
Q_{is} = total quantity (in micrograms) of internal standard added to the water sample.
V = original water sample volume in mL.
RF = mean response factor of analyte from the initial calibration.

12.1.2 Alternatively, use the GC/MS system software or other available proven software to compute the concentrations of the analytes and surrogates from the second or third order regression curves.

12.1.3 Calculations should utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty). Experience indicates that three significant figures may be used for concentrations above 99 µg/L, two significant figures for concentrations between 1- 99 µg/L, and one significant figure for lower concentrations.

12.1.4 Calculate the total trihalomethane concentration by summing the four individual trihalomethane concentrations in µg/L.

13. ACCURACY AND PRECISION

13.1 Single laboratory accuracy and precision data were obtained for the method analytes using laboratory fortified blanks with analytes at concentrations between 1 and 5 µg/L. Four sets of results were obtained using the three columns specified (Sect. 6.3.2) and the open split, cryogenic, and jet separator interfaces (Sect. 6.3.3). These data are shown in Tables 4-6.

13.2 With these data, method detection limits were calculated using the formula (2):

$$MDL = S\ t_{(n-1,1-alpha\ =\ 0.99)}$$

where:

$t_{(n-1,1-alpha\ =\ 0.99)}$ = Student's t value for the 99% confidence level with n-1 degrees of freedom,

n = number of replicates

S = the standard deviation of the replicate analyses.

14. REFERENCES

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TABLE 1. MOLECULAR WEIGHTS AND QUANTITATION IONS FOR METHOD ANALYTES

Compound	MW[a]	Primary Quantitation Ion	Secondary Quantitation Ions
Internal standard			
Fluorobenzene	96	96	77
Surrogates			
4-Bromofluorobenzene	174	95	174,176
1,2-Dichlorobenzene-d4	150	152	115,150
Target Analytes			
Benzene	78	78	77
Bromobenzene	156	156	77,158
Bromochloromethane	128	128	49,130
Bromodichloromethane	162	83	85,127
Bromoform	250	173	175,252
Bromomethane	94	94	96
n-Butylbenzene	134	91	134
sec-Butylbenzene	134	105	134
tert-Butylbenzene	134	119	91
Carbon tetrachloride	152	117	119
Chlorobenzene	112	112	77,114
Chloroethane	64	64	66
Chloroform	118	83	85
Chloromethane	50	50	52
2-Chlorotoluene	126	91	126
4-Chlorotoluene	126	91	126
Dibromochloromethane	206	129	127
1,2-Dibromo-3-Chloropropane	234	75	155,157
1,2-Dibromoethane	186	107	109,188
Dibromomethane	172	93	95,174
1,2-Dichlorobenzene	146	146	111,148
1,3-Dichlorobenzene	146	146	111,148
1,4-Dichlorobenzene	146	146	111,148
Dichlorodifluoromethane	120	85	87
1,1-Dichloroethane	98	63	65,83
1,2-Dichloroethane	98	62	98
1,1-Dichloroethene	96	96	61,63
cis-1,2-Dichloroethene	96	96	61,98
trans-1,2-Dichloroethene	96	96	61,98
1,2-Dichloropropane	112	63	112
1,3-Dichloropropane	112	76	78
2,2-Dichloropropane	112	77	97
1,1-Dichloropropene	110	75	110,77

TABLE 1. (continued)

Compound	MW[a]	Primary Quantitation Ion	Secondary Quantitation Ions
cis-1,3-dichloropropene	110	75	110
trans-1,3-dichloropropene	110	75	110
Ethylbenzene	106	91	106
Hexachlorobutadiene	258	225	260
Isopropylbenzene	120	105	120
4-Isopropyltoluene	134	119	134,91
Methylene chloride	84	84	86,49
Naphthalene	128	128	
n-Propylbenzene	120	91	120
Styrene	104	104	78
1,1,1,2-Tetrachloroethane	166	131	133,119
1,1,2,2-Tetrachloroethane	166	83	131,85
Tetrachloroethene	164	166	168,129
Toluene	92	92	91
1,2,3-Trichlorobenzene	180	180	182
1,2,4-Trichlorobenzene	180	180	182
1,1,1-Trichloroethane	132	97	99,61
1,1,2-Trichloroethane	132	83	97,85
Trichloroethene	130	95	130,132
Trichlorofluoromethane	136	101	103
1,2,3-Trichloropropane	146	75	77
1,2,4-Trimethylbenzene	120	105	120
1,3,5-Trimethylbenzene	120	105	120
Vinyl Chloride	62	62	64
o-Xylene	106	106	91
m-Xylene	106	106	91
p-Xylene	106	106	91

[a]Monoisotopic molecular weight calculated from the atomic masses of the isotopes with the smallest masses.

TABLE 2. CHROMATOGRAPHIC RETENTION TIMES FOR METHOD ANALYTES ON THREE COLUMNS WITH FOUR SETS OF CONDITIONS[a]

Compound	Retention Time (min:sec) Column 1[b]	Column 2[b]	Column 2[c]	Column 3[d]
Internal standard				
Fluorobenzene	8:49	6:27	14:06	8:03
Surrogates				
4-Bromofluorobenzene	18:38	15:43	23:38	
1,2-Dichlorobenzene-d4	22:16	19:08	27:25	
Target Analytes				
Benzene	8:14	5:40	13:30	7:25
Bromobenzene	18:57	15:52	24:00	16:25
Bromochloromethane	6:44	4:23	12:22	5:38
Bromodichloromethane	10:35	8:29	15:48	9:20
Bromoform	17:56	14:53	22:46	15:42
Bromomethane	2:01	0:58	4:48	1:17
n-Butylbenzene	22:13	19:29	27:32	17:57
sec-Butylbenzene	20:47	18:05	26:08	17:28
tert-Butylbenzene	20:17	17:34	25:36	17:19
Carbon Tetrachloride	7:37	5:16	13:10	7:25
Chlorobenzene	15:46	13:01	20:40	14:20
Chloroethane	2:05	1:01		1:27
Chloroform	6:24	4:48	12:36	5:33
Chloromethane	1:38	0:44	3:24	0:58
2-Chlorotoluene	19:20	16:25	24:32	16:44
4-Chlorotoluene	19:30	16:43	24:46	16:49
Cyanogen chloride				1:03
Dibromochloromethane	14:23	11:51	19:12	12:48
1,2-Dibromo-3-Chloropropane	24:32	21:05		18:02
1,2-Dibromoethane	14:44	11:50	19:24	13:36
Dibromomethane	10:39	7:56	15:26	9:05
1,2-Dichlorobenzene	22:31	19:10	27:26	17:47
1,3-Dichlorobenzene	21:13	18:08	26:22	17:28
1,4-Dichlorobenzene	21:33	18:23	26:36	17:38
Dichlorodifluoromethane	1:33	0:42	3:08	0:53
1,1-Dichloroethane	4:51	2:56	10:48	4:02
1,2-Dichloroethane	8:24	5:50	13:38	7:00
1,1-Dichloroethene	2:53	1:34	7:50	2:20
cis-1,2-Dichloroethene	6:11	3:54	11:56	5:04
trans-1,2-Dichloroethene	3:59	2:22	9:54	3:32
1,2-Dichloropropane	10:05	7:40	15:12	8:56
1,3-Dichloropropane	14:02	11:19	18:42	12:29
2,2-Dichloropropane	6:01	3:48	11:52	5:19
1,1-Dichloropropene	7:49	5:17	13:06	7:10

TABLE 2. (continued)

Compound	Retention Time (min:sec) Column 1[b]	Column 2[b]	Column 2[c]	Column 3[d]
cis-1,3-dichloropropene			17:54	
trans-1,3-dichloropropene			16:42	
Ethylbenzene	15:59	13:23	21:00	14:44
Hexachlorobutadiene	26:59	23:41	32:04	19:14
Isopropylbenzene	13:04	15:28	23:18	16:25
4-Isopropyltoluene	21:12	18:31	26:30	17:38
Methylene Chloride	3:36	2:04	9:16	2:40
Naphthalene	27:10	23:31	32:12	19:04
n-Propylbenzene	19:04	16:25	24:20	16:49
Styrene	17:19	14:36	22:24	15:47
1,1,1,2-Tetrachloroethane	15:56	13:20	20:52	14:44
1,1,2,2-Tetrachloroethane	18:43	16:21	24:04	15:47
Tetrachloroethene	13:44	11:09	18:36	13:12
Toluene	12:26	10:00	17:24	11:31
1,2,3-Trichlorobenzene	27:47	24:11	32:58	19:14
1,2,4-Trichlorobenzene	26:33	23:05	31:30	18:50
1,1,1-Trichloroethane	7:16	4:50	12:50	6:46
1,1,2-Trichloroethane	13:25	11:03	18:18	11:59
Trichloroethene	9:35	7:16	14:48	9:01
Trichlorofluoromethane	2:16	1:11	6:12	1:46
1,2,3-Trichloropropane	19:01	16:14	24:08	16:16
1,2,4-Trimethylbenzene	20:20	17:42	31:30	17:19
1,3,5-Trimethylbenzene	19:28	16:54	24:50	16:59
Vinyl chloride	1:43	0:47	3:56	1:02
o-Xylene	17:07	14:31	22:16	15:47
m-Xylene	16:10	13:41	21:22	15:18
p-Xylene	16:07	13:41	21:18	15:18

[a]Columns 1-3 are those given in Sect. 6.3.2.1; retention times were measured from the beginning of thermal desorption from the trap (columns 1-2) or from the beginning of thermal release from the cryogenic interface (column 3).
[b]GC conditions given in Sect. 11.3.1.
[c]GC conditions given in Sect. 11.3.2.
[d]GC conditions given in Sect. 11.3.3.

TABLE 3. ION ABUNDANCE CRITERIA FOR 4-BROMOFLUOROBENZENE (BFB)

Mass (M/z)	Relative Abundance Criteria
50	15 to 40% of mass 95
75	30 to 80% of mass 95
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5 to 9% of mass 174
176	> 95% but < 101% of mass 174
177	5 to 9% of mass 176

TABLE 4. ACCURACY AND PRECISION DATA FROM 16-31 DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE CAPILLARY COLUMN 1[a]

Compound	True Conc. Range (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit (µg/L)
Benzene	0.1-10	97	5.7	0.04
Bromobenzene	0.1-10	100	5.5	0.03
Bromochloromethane	0.5-10	90	6.4	0.04
Bromodichloromethane	0.1-10	95	6.1	0.08
Bromoform	0.5-10	101	6.3	0.12
Bromomethane	0.5-10	95	8.2	0.11
n-Butylbenzene	0.5-10	100	7.6	0.11
sec-Butylbenzene	0.5-10	100	7.6	0.13
tert-Butylbenzene	0.5-10	102	7.3	0.14
Carbon tetrachloride	0.5-10	84	8.8	0.21
Chlorobenzene	0.1-10	98	5.9	0.04
Chloroethane	0.5-10	89	9.0	0.10
Chloroform	0.5-10	90	6.1	0.03
Chloromethane	0.5-10	93	8.9	0.13
2-Chlorotoluene	0.1-10	90	6.2	0.04
4-Chlorotoluene	0.1-10	99	8.3	0.06
Dibromochloromethane	0.1-10	92	7.0	0.05
1,2-Dibromo-3-chloropropane	0.5-10	83	19.9	0.26
1,2-Dibromoethane	0.5-10	102	3.9	0.06
Dibromomethane	0.5-10	100	5.6	0.24
1,2-Dichlorobenzene	0.1-10	93	6.2	0.03
1,3-Dichlorobenzene	0.5-10	99	6.9	0.12
1,4-Dichlorobenzene	0.2-20	103	6.4	0.03
Dichlorodifluoromethane	0.5-10	90	7.7	0.10
1,1-Dichloroethane	0.5-10	96	5.3	0.04
1,2-Dichloroethane	0.1-10	95	5.4	0.06
1,1-Dichloroethene	0.1-10	94	6.7	0.12
cis-1,2 Dichloroethene	0.5-10	101	6.7	0.12
trans-1,2-Dichloroethene	0.1-10	93	5.6	0.06
1,2-Dichloropropane	0.1-10	97	6.1	0.04
1,3-Dichloropropane	0.1-10	96	6.0	0.04
2,2-Dichloropropane	0.5-10	86	16.9	0.35
1,1-Dichloropropene	0.5-10	98	8.9	0.10
cis-1,2-Dichloropropene				
trans-1,2-Dichloropropene				
Ethylbenzene	0.1-10	99	8.6	0.06
Hexachlorobutadiene	0.5-10	100	6.8	0.11
Isopropylbenzene	0.5-10	101	7.6	0.15
4-Isopropyltoluene	0.1-10	99	6.7	0.12
Methylene chloride	0.1-10	95	5.3	0.03
Naphthalene	0.1-100	104	8.2	0.04
n-Propylbenzene	0.1-10	100	5.8	0.04
Styrene	0.1-100	102	7.2	0.04

TABLE 4. (Continued)

Compound	True Conc. Range (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit (µg/L)
1,1,1,2-Tetrachloroethane	0.5-10	90	6.8	0.05
1,1,2,2-Tetrachloroethane	0.1-10	91	6.3	0.04
Tetrachloroethene	0.5-10	89	6.8	0.14
Toluene	0.5-10	102	8.0	0.11
1,2,3-Trichlorobenzene	0.5-10	109	8.6	0.03
1,2,4-Trichlorobenzene	0.5-10	108	8.3	0.04
1,1,1-Trichloroethane	0.5-10	98	8.1	0.08
1,1,2-Trichloroethane	0.5-10	104	7.3	0.10
Trichloroethene	0.5-10	90	7.3	0.19
Trichlorofluoromethane	0.5-10	89	8.1	0.08
1,2,3-Trichloropropane	0.5-10	108	14.4	0.32
1,2,4-Trimethylbenzene	0.5-10	99	8.1	0.13
1,3,5-Trimethylbenzene	0.5-10	92	7.4	0.05
Vinyl chloride	0.5-10	98	6.7	0.17
o-Xylene	0.1-31	103	7.2	0.11
m-Xylene	0.1-10	97	6.5	0.05
p-Xylene	0.5-10	104	7.7	0.13

[a]Data obtained by Robert W. Slater using column 1 with a jet separator interface and a quadrupole mass spectrometer (Sect. 11.3.1) with analytes divided among three solutions.

TABLE 5. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING THE CRYOGENIC TRAPPING OPTION AND A NARROW BORE CAPILLARY COLUMN 3[a]

Compound	True Conc. (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit (µg/L)
Benzene	0.1	99	6.2	0.03
Bromobenzene	0.5	97	7.4	0.11
Bromochloromethane	0.5	97	5.8	0.07
Bromodichloromethane	0.1	100	4.6	0.03
Bromoform	0.1	99	5.4	0.20
Bromomethane	0.1	99	7.1	0.06
n-Butylbenzene	0.5	94	6.0	0.03
sec-Butylbenzene	0.5	90	7.1	0.12
tert-Butylbenzene	0.5	90	2.5	0.33
Carbon tetrachloride	0.1	92	6.8	0.08
Chlorobenzene	0.1	91	5.8	0.03
Chloroethane	0.1	100	5.8	0.02
Chloroform	0.1	95	3.2	0.02
Chloromethane	0.1	99	4.7	0.05
2-Chlorotoluene	0.1	99	4.6	0.05
4-Chlorotoluene	0.1	96	7.0	0.05
Cyanogen chloride[b]		92	10.6	0.30
Dibromochloromethane	0.1	99	5.6	0.07
1,2-Dibromo-3-chloropropane	0.1	92	10.0	0.05
1,2-Dibromoethane	0.1	97	5.6	0.02
Dibromomethane	0.1	93	6.9	0.03
1,2-Dichlorobenzene	0.1	97	3.5	0.05
1,3-Dichlorobenzene	0.1	99	6.0	0.05
1,4-Dichlorobenzene	0.1	93	5.7	0.04
Dichlorodifluoromethane	0.1	99	8.8	0.11
1,1-Dichloroethane	0.1	98	6.2	0.03
1,2-Dichloroethane	0.1	100	6.3	0.02
1,1-Dichloroethene	0.1	95	9.0	0.05
cis-1,2 Dichloroethene	0.1	100	3.7	0.06
trans-1,2-Dichloroethene	0.1	98	7.2	0.03
1,2-Dichloropropane	0.1	96	6.0	0.02
1,3-Dichloropropane	0.1	99	5.8	0.04
2,2-Dichloropropane	0.1	99	4.9	0.05
1,1-Dichloropropene	0.1	98	7.4	0.02
cis-1,3-Dichloropropene				
trans-1,3-Dichloropropene				
Ethylbenzene	0.1	99	5.2	0.03
Hexachlorobutadiene	0.1	100	6.7	0.04
Isopropylbenzene	0.5	98	6.4	0.10
4-Isopropyltoluene	0.5	87	13.0	0.26
Methylene chloride	0.5	97	13.0	0.09
Naphthalene	0.1	98	7.2	0.04

TABLE 5. (Continued)

Compound	True Conc. (µg/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit (µg/L)
n-Propylbenzene	0.1	99	6.6	0.06
Styrene	0.1	96	19.0	0.06
1,1,1,2-Tetrachloroethane	0.1	100	4.7	0.04
1,1,2,2-Tetrachloroethane	0.5	100	12.0	0.20
Tetrachloroethene	0.1	96	5.0	0.05
Toluene	0.1	100	5.9	0.08
1,2,3-Trichlorobenzene	0.1	98	8.9	0.04
1,2,4-Trichlorobenzene	0.1	91	16.0	0.20
1,1,1-Trichloroethane	0.1	100	4.0	0.04
1,1,2-Trichloroethane	0.1	98	4.9	0.03
Trichloroethene	0.1	96	2.0	0.02
Trichlorofluoromethane	0.1	97	4.6	0.07
1,2,3-Trichloropropane	0.1	96	6.5	0.03
1,2,4-Trimethylbenzene	0.1	96	6.5	0.04
1,3,5-Trimethylbenzene	0.1	99	4.2	0.02
Vinyl chloride	0.1	96	0.2	0.04
o-Xylene	0.1	94	7.5	0.06
m-Xylene	0.1	94	4.6	0.03
p-Xylene	0.1	97	6.1	0.06

[a]Data obtained by Caroline A. Madding using column 3 with a cryogenic interface and a quadrupole mass spectrometer (Sect 11.3.3).
[b]Reference 8.

TABLE 6. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE CAPILLARY COLUMN 2[a]

Compound	No.[b]	Mean Accuracy (% of True Value, 2 µg/L Conc.)	RSD (%)	Mean Accuracy (% of True Value, 0.2 µg/L Conc.)	RSD (%)
Internal Standard					
Fluorobenzene	1	-	-	-	-
Surrogates					
4-Bromofluorobenzene	2	98	1.8	96	1.3
1,2-Dichlorobenzene-d_4	3	97	3.2	95	1.7
Target Analytes					
Benzene	37	97	4.4	113	1.8
Bromobenzene	38	102	3.0	101	1.9
Bromochloromethane	4	99	5.2	102	2.9
Bromodichloromethane	5	96	1.8	100	1.8
Bromoform	6	89	2.4	90	2.2
Bromomethane	7	55	27.	52	6.7
n-Butylbenzene	39	89	4.8	87	2.3
sec-Butylbenzene	40	102	3.5	100	2.8
tert-Butylbenzene	41	101	4.5	100	2.9
Carbon tetrachloride	8	84	3.2	92	2.6
Chlorobenzene	42	104	3.1	103	1.6
Chloroethane[c]					
Chloroform	9	97	2.0	95	2.1
Chloromethane	10	110	5.0	d	
2-Chlorotoluene	43	91	2.4	108	3.1
4-Chlorotoluene	44	89	2.0	108	4.4
Dibromochloromethane	11	95	2.7	100	3.0
1,2-Dibromo-3-chloropropane[c]					
1,2-Dibromoethane[c]					
Dibromomethane	13	99	2.1	95	2.2
1,2-Dichlorobenzene	45	93	2.7	94	5.1
1,3-Dichlorobenzene	46	100	4.0	87	2.3
1,4-Dichlorobenzene	47	98	4.1	94	2.8
Dichlorodifluoromethane	14	38	25.	d	
1,1-Dichloroethane	15	97	2.3	85	3.6
1,2-Dichloroethane	16	102	3.8	100	2.1
1,1-Dichloroethene	17	90	2.2	87	3.8
cis-1,2-Dichloroethene	18	100	3.4	89	2.9
trans-1,2-Dichloroethene	19	92	2.1	85	2.3

TABLE 6. (Continued)

Compound	No.[b]	Mean Accuracy (% of True Value, 2 µg/L Conc.)	RSD (%)	Mean Accuracy (% of True Value, 0.2 µg/L Conc.)	RSD (%)
1,2-Dichloropropane	20	102	2.2	103	2.9
1,3-Dichloropropane	21	92	3.7	93	3.2
2,2-Dichloropropane[c]					
1,1-Dichloropropene[c]					
cis-1,3-Dichloropropene[c]					
trans-1,3-Dichloropropene	25	96	1.7	99	2.1
Ethylbenzene	48	96	9.1	100	4.0
Hexachlorobutadiene	26	91	5.3	88	2.4
Isopropylbenzene	49	103	3.2	101	2.1
4-Isopropyltoluene	50	95	3.6	95	3.1
Methylene chloride	27	[e]		[e]	
Naphthalene	51	93	7.6	78	8.3
n-Propylbenzene	52	102	4.9	97	2.1
Styrene	53	95	4.4	104	3.1
1,1,1,2-Tetrachloroethane	28	99	2.7	95	3.8
1,1,2,2-Tetrachloroethane	29	101	4.6	84	3.6
Tetrachloroethene	30	97	4.5	92	3.3
Toluene	54	105	2.8	126	1.7
1,2,3-Trichlorobenzene	55	90	5.7	78	2.9
1,2,4-Trichlorobenzene	56	92	5.2	83	5.9
1,1,1-Trichloroethane	31	94	3.9	94	2.5
1,1,2-Trichloroethane	32	107	3.4	109	2.8
Trichloroethene	33	99	2.9	106	2.5
Trichlorofluoromethane	34	81	4.6	48	13.
1,2,3-Trichloropropane	35	97	3.9	91	2.8
1,2,4-Trimethylbenzene	57	93	3.1	106	2.2
1,3,5-Trimethylbenzene	58	88	2.4	97	3.2
Vinyl chloride	36	104	3.5	115	14.
o-Xylene	59	97	1.8	98	1.7
m-Xylene	60	[f]		[f]	
p-Xylene	61	98	2.3	103	1.4

[a]Data obtained by James W. Eichelberger using column 2 with the open split interface and an ion trap mass spectrometer (Sect. 11.3.2) with all method analytes in the same reagent water solution.
[b]Designation in Figures 1 and 2.
[c]Not measured; authentic standards were not available.
[d]Not found at 0.2 µg/L.
[e]Not measured; methylene chloride was in the laboratory reagent blank.
[f]m-xylene coelutes with and cannot be distinguished from its isomer p-xylene, No 61.

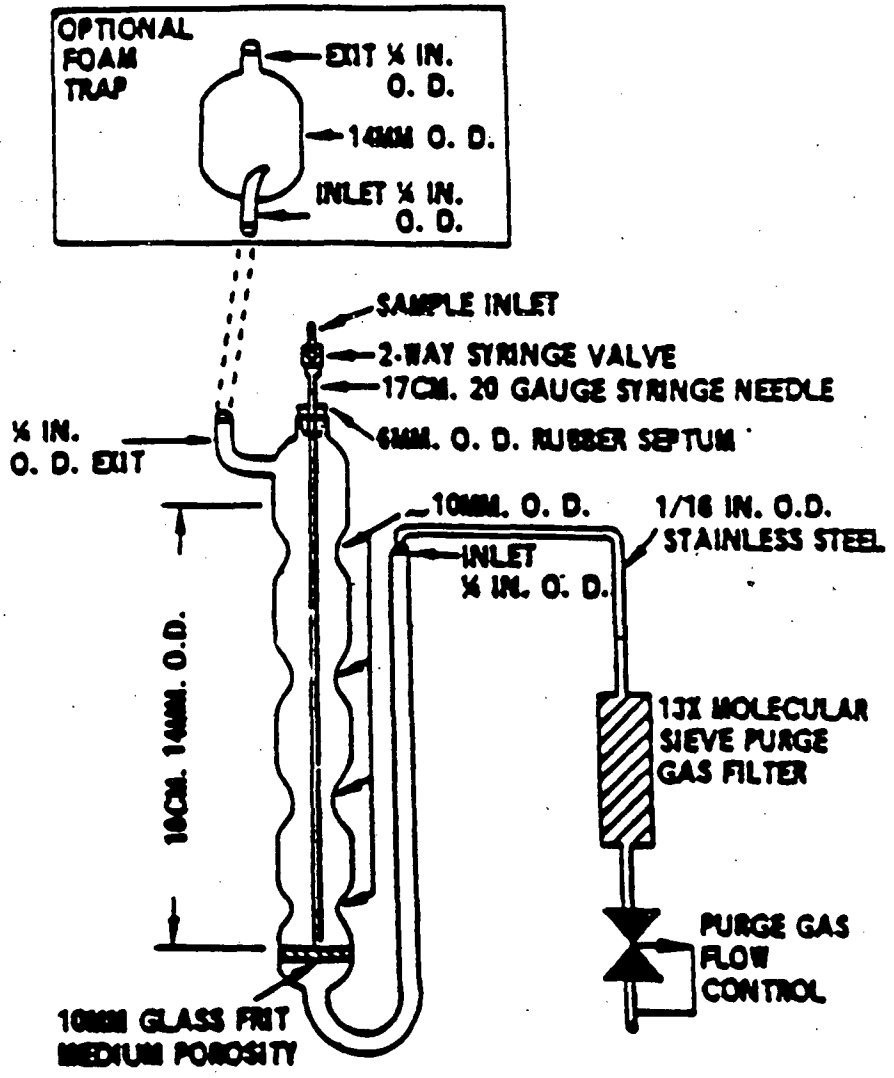


FIGURE 1. PURGING DEVICE

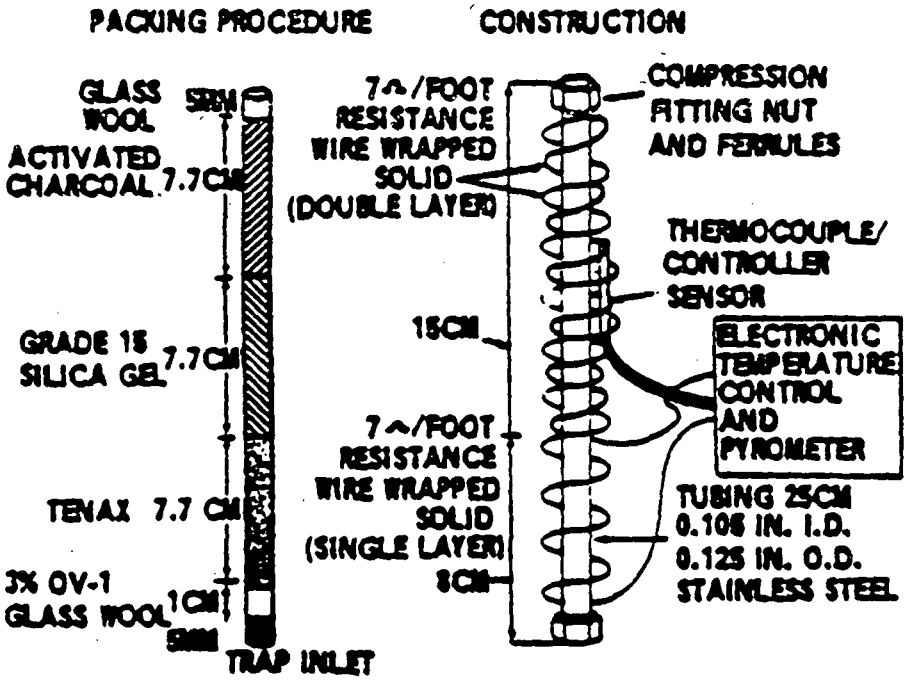


FIGURE 2. TRAP PACKINGS AND CONSTRUCTION TO INCLUDE DESORB CAPABILITY

FIGURE 3. NORMALIZED TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF MOST COMPOUNDS. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.

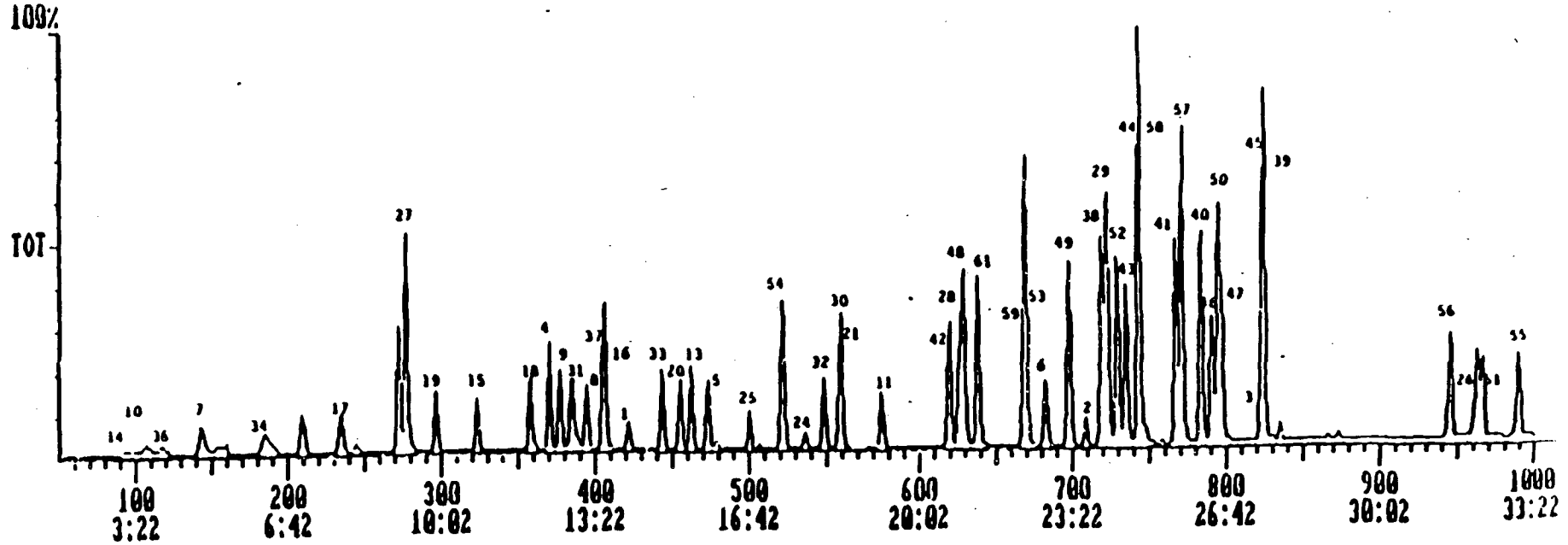
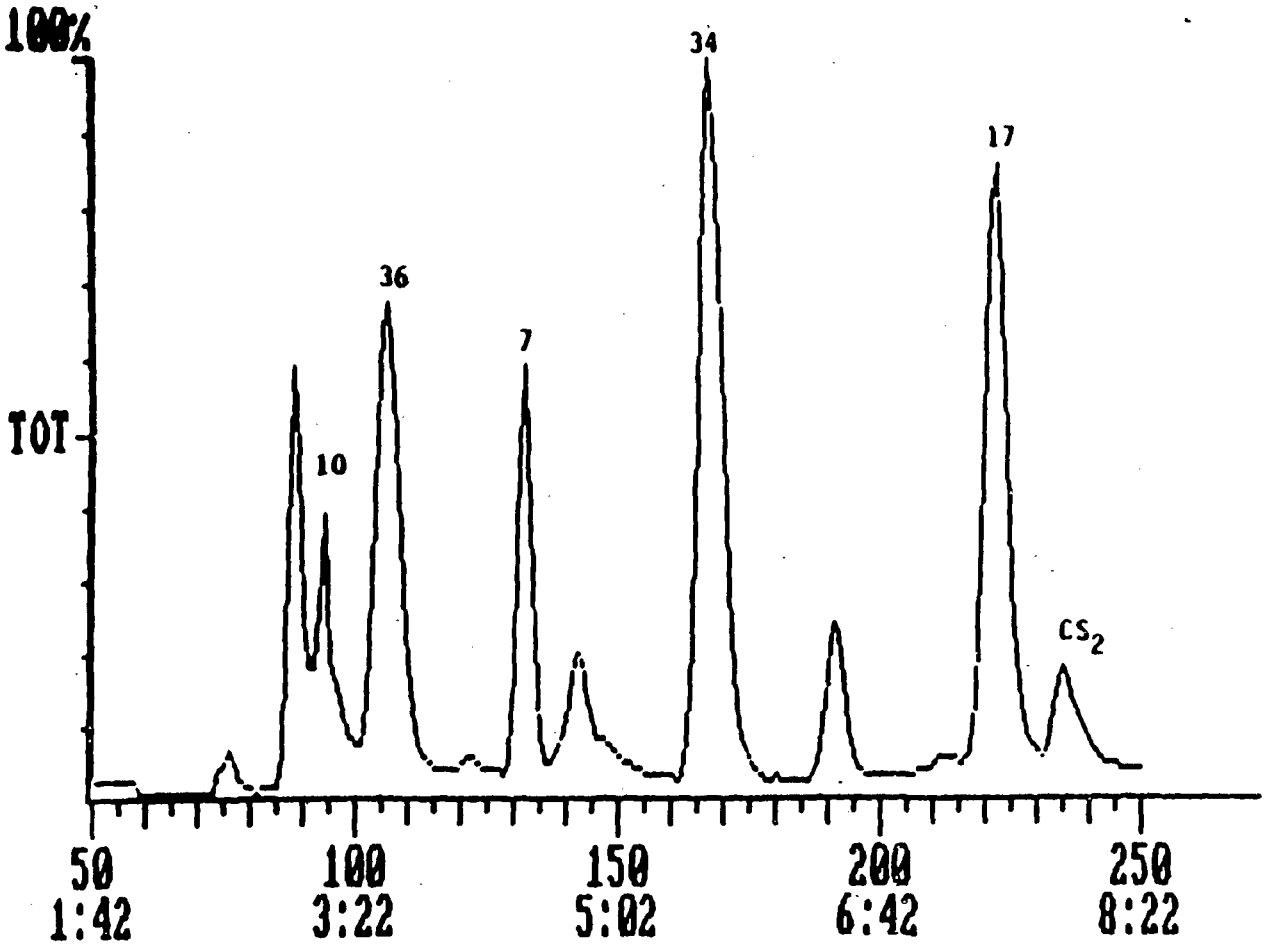


FIGURE 4. AMPLIFIED FIRST EIGHT MINUTES OF A TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF EACH COMPONENT. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.



APPENDIX C

CALIBRATION AND MAINTENANCE PROCEDURE FOR ANALYTICAL FIELD EQUIPMENT

CALIBRATION AND MAINTENANCE PROCEDURE
YSI MODEL 33 S-C-T METER

1.0 INTRODUCTION

This procedure presents steps to calibrate and maintain the YSI Model 33 S-C-T meter. Operation principles, procedures, and equipment specifications are presented in Procedure 5617002 and are not repeated here.

2.0 CALIBRATION

2.1 Temperature

2.1.1 Temperature Knob Setting

It is possible for the temperature knob to become loose or slip from its normal position. In an emergency, the dial can be repositioned. It must be emphasized that this is an emergency procedure only and that the instrument should be returned to the factory for proper recalibration - at the earliest opportunity.

To recalibrate the temperature setting:

1. Red line instrument and then place probe in sample of known conductivity.
2. Read and record the temperature and conductivity of the solution using appropriate settings. Leave probe in solution.
3. Determine the salinity of the solution by running a line vertically on Figure 1 until it intersects the appropriate 'C line. From this intersection, extend a line horizontally to the left edge of the graph (Figure 1). This determines the salinity of the sample.

6. Number of days analysis and data required after laboratory receipt of samples:

   21 days

7. Analytical protocol required (attach copy if other than a protocol currently used in this program:

   Inorganic analysis as per SOW 7/88, with the exceptions listed in Attachments II and III. ICP emission spectroscopy analysis follows the SOW mentioned above for sample preparation and analysis protocol with the instrument detection limits and matrix spike levels given in Attachment II and the QC audits as described in Attachment III. GFAA analyses may be run undigested if the samples are free of particulates. If particulates are present the samples are to be digested as per SOW mentioned above. A detailed set of instructions for conducting the GFAA analyses are included in Attachment III. Special instrument detection limits and matrix spike levels are listed on Attachment II.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): 1) Check the pH of each sample (wide range pH paper is acceptable). If the pH values are outside of the specified limits of SOW, contact Region V for instructions. 2) Instrument Detection limits (IDL) of Attachment II are to be met prior to any sample analysis. 3) Spike all parameters as per Attachment II.

   The GFAA protocol is specified in Attachment III. The frequency and limits of certain audits are changed from that given in SOW for all analyses as per Attachment III.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

   All of the deliverables included in SOW 7/88 or current SOW are required. Also, provide current quarterly XI, XII, XIII for each case. Submit Form VIII separate for each separate parameter analyzed by MSA. Form VIII must be modified to include the slope of each addition as well as the correlation coefficient. Use footnotes on Form I for reporting results, except use IDL of Attachment II for detection limit. Make changes on Forms V, VI, VII to reflect SAS contract limits and IDL where appropriate. All analytical results will be reported down to MDL, and flagged with "J".

10. Other (use additional sheets or attach supplementary information, as needed):

    _____

11. Name of sampling/shipping contact: Wendy Dewar/Robert Hank

    Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired (+% or Conc.)
ICP Metals (Cr)	See Attachment II	10% RPD or Duplicate
Furnace Metals (As, Pb, Cd)	See Attachment II	Differences $\leq$ SAS IDL of - Attachment II

II. QC REQUIREMENTS

Audits Required	Frequency of Audits	Limits* (% or Conc.)
For ICP Chromium	See 9.A of Attachment III	
GFAA (undigested) As,Cd,Pb	See 9.B of Attachment III	
GFAA (digested) As,Cd,Pb	See 9.C of Attachment III	

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Take corrective action and repeat analysis

Contact Jay Thakkar at (312)886-1972

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

ATTACHMENT I

SCHEDULE

TENTATIVE START DATE: 6/4/90

SAMPLING FOR SOUTHEAST ROCKFORD

OPERABLE UNIT

WEEK	INVESTIGATIVE SAMPLES	FIELD BLANKS	FIELD DUPLICATE
1	77	8	8
2	78	9	9

NOTE: Samples will be shipped on a daily basis.

ATTACHMENT II

Instrument Detection Limit and Spiking Level for Drinking Water

	Compound	Required Instrument Detection Limit[1] ug/L			Required Matrix Spike Concentrations ug/L		
		GFAA	ICP	Other	GFAA	ICP	Other
	Metal:						
1.	Arsenic	5			20		
2.	Cadmium[2]	0.5			2	50	
3.	Chromium		10			200	
4.	Lead[2]	2			20	500	

[1] Instrument Detection Limits (IDL) must be met before any samples are analyzed. The Lab may submit their quarterly Form XI with each case if all IDLs meet the detection limits. If detection limits cannot be met by using ICP, use of GFAA required.

[2] ICP analysis results may only be reported for Cd and Pb, if the concentration is $\geq$ 10 times the IDL of instrument used. If ICP results are reported, all ICP audits are required including matrix spike.

ATTACHMENT III

Special Instruments for GFAA and QC Requirements for All Analysis

1. Sample aliquots are preserved in the field as follows:

   a) One liter preserved with 5ml/l of 50% HNO_3 to pH<2 for all metals (excluding Hg).

2. Analysis of the metals (specified in Attachment II) by graphite furnace atomic absorption (GFAA) must use the method of standard additions for quantitation.

3. All of the samples for GFAA metals can be analyzed without digestion if the samples are clean and without any particulates. In this case, a calibration blank, duplicate, ICVS, and CCVS shall be analyzed without digestion. If CCV is out, rerun previous to samples and CCV.

4. If any of the samples contain particulate or significant suspended solids, sample aliquots, preparation blank, duplicate, matrix spikes and lab control samples are to be digested per page D-2 of SOW.

5. No identified field blank may be used as a laboratory duplicate or matrix spike sample.

6.1 Zeeman, Smith/Hieftje background correction or equivalent (not D_2) is required for Arsenic or any element with structured background interferences.

6.2 The matrix modifiers of SOW 785 are mandatory for As.

6.3 L'vov platform is allowed.

6.4 Any matrix modifiers for Cd, and Pb must be approved by the Region V Central Regional Laboratory prior to use and documented with the raw data.

6.5 Each sample or QC audit is to be determined by the MSA using the sample or QC audit and then three consecutive spikes.

6.6 Each calibration blank and QC audit solution must contain the same nitric acid concentration as the sample (or diluted samples). All solutions analyzed must have their matrix concentrations fully documented in the raw data.

6.7 Each analytical determination must have the resulting absorbance clearly recorded and documented in the order of determined.

6.8 The data for each MSA determination must show; slope (signal/conc.), intercept and correlation coefficient (r). The results must be reported on Form VIII for all samples and QC audits in order of analysis. Form VIII must be modified to include the above mentioned slope.

6.9 Samples and QC audits will be tested in the following order for the method of standard addition quantitation.

a) calibration blank and + 3 spikes
b) ICVS (provided by EMSL-LV) + 3 spikes
c) 5 samples, each with 3 spikes
d) calibration blank + 3 spikes
e) CCVS + 3 spikes
f) succeeding sets of 5 samples, calibration blank, and CCVS.

7. Report the correlation coefficient for all MSA analyses. $r \geq 0.995$ is required for all sample and audit analyses. A correlation coefficient $(r) \geq 0.998$ is recommended for the calibration blank or problems will occur with the sample analysis. If $r<0.995$ or the slope is <35% of the initial calibration blank, reanalyze the sample once. If the standard addition again fails these criteria, dilute the sample 1:1 or minimum dilution and reanalyze. If the standard addition again fails, flag the data with a "+".

8. Care must be taken to avoid exceeding the linear range for all GFAA analyses. This problem is especially severe with Cd and Pb. Dilution of the samples may be necessary to avoid this problem.

9. If sample concentration is higher than the highest spike added dilute sample 1:1 and reanalyze.

10. For MSA, use 10, 20, and 30 ug/l calibration standards and for Cadmium, use 1, 2 and 3 ug/l calibration standards for 3 spike addition.

ATTACHMENT III
QC REQUIREMENTS

9.A ICP Metals Audits Required	Frequency of Audits	Limits
ICVS, CCVS, ICP serial dilution, ICP ICS	as per SOW 7/88	as per SOW 7/88
Calibration Blank	beginning of run and 1 in 10 thereafter	≤ IDL
Preparation Blank	1 in 10 samples	≤ SAS IDL of Attachment II
Duplicate	1 in 10 samples	10% RPD or Difference is ≤ SAS IDL, 15% for Hg & CN
CRDL Standard (using SAS DL)	as per SOW 7/88	
Matrix Spike (ICP)	1 in 10 samples	85 - 115% Recovery
Matrix Spike (ICP-Ca, Mg, Na, K)*	1 in 10 samples	85 - 115% Recovery
Matrix Spike (Hg & CN)	1 in 10 samples	80 - 120%
Lab Control Sample (Digested)	1 per sample set	85 - 115%

*May be combined with other spike (cf Item 8 of SAS).

9.B GFAA Undigested Samples Audits Required	Frequency of Audits	Limits
1) Duplicate	1 in 10 samples	Difference of ≤ SAS IDL of Attachment II or ≤ 10% RPD
2) Calibration Blank	Initially and after every 5 samples	≤ IDL
3) ICVS and CCVS	Initially ICVS, and CCVS after every 5 samples	90% - 110%

9.C	GFAA Digested Samples Audits Required	Frequency of Audits	Limits
	1) Calibration Blank	Initially and after every 5 samples	≤ IDL
	2) Preparation Blank (Digested)	1 in 10 samples	≤ SAS IDL of Attachment II
	3) Duplicates (Digested)	1 in 10 samples	Difference of ≤ SAS IDL or 10% RPD
	4) Matrix Spike	1 in 10 samples	85 - 115% Recovery
	5) Lab Control Sample (Digested)	1 per set of samples	85 - 115% Recovery
	6) ICVS, CCVS	Initially ICVS, and CCVS after every 5 samples	90 - 110% Recovery

U.S. Environmental Protection Agency
CLP Sample Management Office
P.O. Box 818, Alexandria, Virgina 22313
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES
Client Request

[x] Regional Transmittal [ ] Telephone Request

A. EPA Region/Client: Region V

B. RSCC Representative: Jan Pels

C. Telephone Number: (312) 353-2720

D. Date of Request: May 1990

E. Site Name: Southeast Rockford

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water for VOCs by EPA Method 524.2, Revision 3 for the 9 compounds listed in Attachment I. Samples that have an estimated total VOC concentration over 50 ug/l will be identified and labeled on the Traffic Report and sample tags and at the laboratories' option, may be screened using the CLP VOA optional screening method of hexadecane extract for volatiles of SOW 7/88. Estimates of VOC concentration range from 0-200 ug/l. If the concentration exceeds 50 ug/l run at 1 x and if necessary dilute so that the compound with the highest concentration falls within the calibration range. Report all reanalysis results at each dilution denoting dilution factors and the compounds that exceeded the calibration range. Results at each dilution, including non-diluted results, shall be submitted with the data package.

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

   144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates and 1 trip blank per cooler totaling 15. Samples will be collected over a 2 week period. Samples are water samples with total VOC concentration estimated to be in the 0-200 ug/l range.

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

   Superfund Remedial State Lead

4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment II)

5. Estimated date(s) and method of shipment: June 4 to June 16, 1990 - Overnight Express Service.

6. Number of days analysis and data required after laboratory receipt of samples:

   Analysis within 5 days of sample receipt. Full data package due within 21 days.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

   Method 524.2, Revision 3 (Attachment III). The accuracy and precision range required for sample analysis is 0.5 to 50 ug/l. A study of the accuracy and precision over the range of 0.5 to 50 ug/l shall be completed by the lab and the results must be submitted with the data. The accuracy and precision of the lab control standard, which can be one of the standards used for calibration, shall be ± 20 percent. Wide-bore, thick-film columns will be used for analysis. Five calibration standards composed of 8 of the 9 compounds listed in Attachment I (cis-1,2-dichloroethylene will be used for calibration but not trans-1,2-dichloroethylene) will be used to obtain calibration over a 0.5 to 50 ug/l range. The GC/MS will be calibrated for only the 9 compounds of concern (Attachment I). For each calibration standard the relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units. The lab can choose the appropriate calibration standard concentrations in order to obtain calibration over the 0.5 to 50 ug/l range. The optional vinyl chloride calibration procedure from Section 9.4 of Method 524.2, Revision 3 will be used. The %RSD for each individual calibration compound must be less than or equal to 30.0 percent.
   The continuing calibration check standard shall contain all nine (9) target compounds. If percent difference of any compound of the continuing calibration check standard is greater than 25%, then corrective action shall be taken. The minimum relative response factor (RF) for each target compound shall be greater than 0.150.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): Complete resolution of cis-1,2-dichloroethylene and trans-1,2-dichloroethylene is required with cis-1,2-dichloroethylene used for calibration. Surrogates and matrix spikes appropriate for each method must be performed. Perform surrogate spike analysis described in Method 524.2, Revision 3, Section 10.3.3 and 7.5.1 with BFB as the surrogate at a concentration of 5 ug/l. The internal standard shall consist of fluorobenzene at a concentration of 5 ug/l. The matrix spike (MS) standard shall consist of all 9 target compounds. The MS Standard specified in CLP SOW shall NOT be used. One quality control standard from an external source must be analyzed per laboratory. The external quality control standard will at minimum contain the 9 contaminants of concern. The results must be submitted with the data. Standard and surrogate compounds must be supplied by the laboratory.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

   Complete EPA CLP type data package including but not limited: narrative, QC Summary, chromatograms, integration reports, all standard and spiking concentrations, injection volumes, dilution factors, analytical sequence summary, calculation, dates and times. Only the 9 target compounds, if detected, shall be reported, all other volatile organics shall NOT be reported. All analytical results will be reported down to MDL, and flagged with "J".

10. Other (use additional sheets or attach supplementary information, as needed):

    After samples that contain a total VOC concentration of greater than 50 ug/l are analyzed a lab reagent blank must be analyzed to check for cross contamination. Samples that require ascorbic acid addition for dechlorination will be labeled. All other samples require no preservation except for cooling to 4°C.

11. Name of sampling/shipping contact: Robert Hank/Wendy Dewar

    Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired (+% or Conc.)
See Attachment I		

II. QC AUDIT REQUIREMENTS

Audits Required	Frequency of Audits	Limits* (% or Conc.)
Surrogate Spiking	All Samples, Stds. Blanks	± 15%
Duplicate Analysis	1 per 10	20% RPD for compounds present at more than 10x MDL
Lab Reagent Blank	1 per 10*	Less than Method Detection Limit
Matrix Spike/Matrix Spike Duplicate**	1 per 25 or per lab	80-120% recovery, 20% RPD
QC Check Sample***	Once each time 5 pt. calibration curve is generated.	±20% @ 5 ug/l for 7 out of 8 compounds. TCE must be in control.

*A field blank may not be substituted.
**Matrix Spike/Matrix Spike Duplicate must be composed of the compounds being analyzed.
***All target compounds except vinyl chloride must be in this sample.

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

If surrogate spike recovery is greater than ±15%, reanalyze once. If recovery is again greater than ±15% report data as estimated. If duplicate is greater than 20 RPD for required compounds, repeat once and report results. If matrix spike does not meet limits do not repeat, report results, flag data.

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

ATTACHMENT I

COMPOUND	METHOD DETECTION LIMIT (ug/l)
Trichloroethylene	0.50
1,1,1 Trichloroethane	0.50
1,1-Dichloroethylene	0.50
Tetrachloroethylene	0.50
1,2-Dichloroethane	0.50
1,1-Dichloroethane	0.50
Vinyl Chloride	0.50
Cis-1,2-Dichloroethylene	0.50
Trans-1,2-Dichloroethylene	0.50

ATTACHMENT II
SCHEDULE
TENTATIVE START DATE: 6/4/90
SAMPLING FOR SOUTHEAST ROCKFORD
OPERABLE UNIT

WEEK	INVESTIGATIVE SAMPLES	FIELD BLANKS	FIELD DUPLICATE	TRIP BLANK
1	77	8	8	7
2	78	9	9	8

NOTE: Samples will be shipped on a daily basis.

ATTACHMENT III
METHOD 524.2

METHOD 524.2. MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY

Revision 3.0

A. Alford-Stevens, J. W. Eichelberger, W. L. Budde - Method 524, Revision 1.0 (1983)

R. W. Slater, Jr. - Method 524.2, Revision 2.0 (1986)

J. W. Eichelberger, W. L. Budde - Method 524.2, Revision 3.0 (1989)

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

METHOD 524.2

MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY

1. SCOPE AND APPLICATION

1.1 This is a general purpose method for the identification and simultaneous measurement of purgeable volatile organic compounds in finished drinking water, raw source water, or drinking water in any treatment stage (1-2). The method is applicable to a wide range of organic compounds, including the four trihalomethane disinfection by-products, that have sufficiently high volatility and low water solubility to be efficiently removed from water samples with purge and trap procedures. The following compounds can be determined by this method.

Compound	Chemical Abstract Service Registry Number
Benzene	71-43-2
Bromobenzene	108-86-1
Bromochloromethane	74-97-5
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
n-Butylbenzene	104-51-8
sec-Butylbenzene	135-98-8
tert-Butylbenzene	98-06-6
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane	74-87-3
2-Chlorotoluene	95-49-8
4-Chlorotoluene	106-43-4
Dibromochloromethane	124-48-1
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane	106-93-4
Dibromomethane	74-95-3
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-4
trans-1,2-Dichloroethene	156-60-5
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9

2,2-Dichloropropane	590-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
Hexachlorobutadiene	87-68-3
Isopropylbenzene	98-82-8
4-Isopropyltoluene	99-87-6
Methylene chloride	75-09-2
Naphthalene	91-20-3
n-Propylbenzene	103-65-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-3
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl chloride	75-01-4
o-Xylene	95-47-6
m-Xylene	108-38-3
p-Xylene	106-42-3

1.2 Method detection limits (MDLs) (3) are compound and instrument dependent and vary from approximately 0.02-0.35 µg/L. The applicable concentration range of this method is primarily column dependent and is approximately 0.02 to 200 µg/L for the wide-bore thick-film columns. Narrow-bore thin-film columns may have a capacity which limits the range to about 0.02 to 20 µg/L. Analytes that are inefficiently purged from water will not be detected when present at low concentrations, but they can be measured with acceptable accuracy and precision when present in sufficient amounts.

1.3 Analytes that are not separated chromatographically, but which have different mass spectra and non-interfering quantitation ions, can be identified and measured in the same calibration mixture or water sample (Sect 11.6.2). Analytes which have very similar mass spectra cannot be individually identified and measured in the same calibration mixture or water sample unless they have different retention times (Sect.11.6.3). Coeluting compounds with very similar mass spectra, typically many structural isomers, must be reported as an isomeric group or pair. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary column, and if not, must be reported as isomeric pairs.

2. SUMMARY OF METHOD

2.1 Volatile organic compounds and surrogates with low water solubility are extracted (purged) from the sample matrix by bubbling an inert gas through the aqueous sample. Purged sample components are trapped in a tube containing suitable sorbent materials. When purging is complete, the sorbent tube is heated and backflushed with helium to desorb the trapped sample components into a capillary gas chromatography (GC) column interfaced to a mass spectrometer (MS). The column is temperature programmed to separate the method analytes which are then detected with the MS. Compounds eluting from the GC column are identified by comparing their measured mass spectra and retention times to reference spectra and retention times in a data base. Reference spectra and retention times for analytes are obtained by the measurement of calibration standards under the same conditions used for samples. The concentration of each identified component is measured by relating the MS response of the quantitation ion produced by that compound to the MS response of the quantitation ion produced by a compound that is used as an internal standard. Surrogate analytes, whose concentrations are known in every sample, are measured with the same internal standard calibration procedure.

3. DEFINITIONS

3.1 Internal standard -- A pure analyte(s) added to a solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same solution. The internal standard must be an analyte that is not a sample component.

3.2 Surrogate analyte -- A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction and is measured with the same procedures used to measure other sample components. The purpose of a surrogate analyte is to monitor method performance with each sample.

3.3 Laboratory duplicates (LD1 and LD2) -- Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

3.4 Field duplicates (FD1 and FD2) -- Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

3.5 Laboratory reagent blank (LRB) -- An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method

analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

3.6 Field reagent blank (FRB) -- Reagent water placed in a sample container in the laboratory and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

3.7 Laboratory performance check solution (LPC) -- A solution of one or more compounds (analytes, surrogates, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

3.8 Laboratory fortified blank (LFB) -- An aliquot of reagent water to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements at the required method detection limit.

3.9 Laboratory fortified sample matrix (LFM) -- An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations.

3.10 Stock standard solution -- A concentrated solution containing a single certified standard that is a method analyte, or a concentrated solution of a single analyte prepared in the laboratory with an assayed reference compound. Stock standard solutions are used to prepare primary dilution standards.

3.11 Primary dilution standard solution -- A solution of several analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.

3.12 Calibration standard (CAL) -- a solution prepared from the primary dilution standard solution and stock standard solutions of the internal standards and surrogate analytes. The CAL solutions are used to calibrate the instrument response with respect to analyte concentration.

3.13 Quality control sample (QCS) -- a sample matrix containing method analytes or a solution of method analytes in a water miscible solvent which is used to fortify reagent water or environmental samples. The QCS is obtained from a source external to the laboratory, and is used

to check laboratory performance with externally prepared test materials.

4. INTERFERENCES

4.1 During analysis, major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) plastic tubing, non-PTFE thread sealants, or flow controllers with rubber components in the purging device should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of laboratory reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in laboratory reagent blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter. Subtracting blank values from sample results is not permitted.

4.2 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing relatively high concentrations of volatile organic compounds. A preventive technique is between-sample rinsing of the purging apparatus and sample syringes with two portions of reagent water. After analysis of a sample containing high concentrations of volatile organic compounds, one or more laboratory reagent blanks should be analyzed to check for cross contamination.

4.3 Special precautions must be taken to determine methylene chloride. The analytical and sample storage area should be isolated from all atmospheric sources of methylene chloride, otherwise random background levels will result. Since methylene chloride will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing should be constructed of stainless steel or copper tubing. Laboratory worker's clothing should be cleaned frequently since clothing previously exposed to methylene chloride fumes during common liquid/liquid extraction procedures can contribute to sample contamination.

5. SAFETY

5.1 The toxicity or carcinogenicity of chemicals used in this method has not been precisely defined; each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. Each laboratory is responsible for maintaining awareness of OSHA regulations regarding safe handling of chemicals used in this method. Additional references to laboratory safety are available (4-6) for the information of the analyst.

5.2 The following method analytes have been tentatively classified as known or suspected human or mammalian carcinogens: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichloroethane, hexachlorobutadiene 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chloro-

form, 1,2-dibromoethane,tetrachloroethene, trichloroethene, and vinyl chloride. Pure standard materials and stock standard solutions of these compounds should be handled in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

6. APPARATUS AND EQUIPMENT

6.1 SAMPLE CONTAINERS -- 60-mL to 120-mL screw cap vials (Pierce #19832 or equivalent) each equipped with a PTFE-faced silicone septum (Pierce #12718 or equivalent). Prior to use, wash vials and septa with detergent and rinse with tap and distilled water. Allow the vials and septa to air dry at room temperature, place in a 105°C oven for 1 hr, then remove and allow to cool in an area known to be free of organics.

6.2 PURGE AND TRAP SYSTEM -- The purge and trap system consists of three separate pieces of equipment: purging device, trap, and desorber. Systems are commercially available from several sources that meet all of the following specifications.

6.2.1 The all glass purging device (Figure 1) should be designed to accept 25-mL samples with a water column at least 5 cm deep. A smaller (5-mL) purging device is recommended if the GC/MS system has adequate sensitivity to obtain the method detection limits required. Gaseous volumes above the sample must be kept to a minimum (< 15 mL) to eliminate dead volume effects. A glass frit should be installed at the base of the sample chamber so the purge gas passes through the water column as finely divided bubbles with a diameter of < 3 mm at the origin. Needle spargers may be used, however, the purge gas must be introduced at a point about 5 mm from the base of the water column.

6.2.2 The trap (Figure 2) must be at least 25 cm long and have an inside diameter of at least 0.105 in. Starting from the inlet, the trap should contain 1.0 cm of methyl silicone coated packing and the following amounts of adsorbents: 1/3 of 2,6-diphenylene oxide polymer, 1/3 of silica gel, and 1/3 of coconut charcoal. If it is not necessary to determine dichlorodifluoromethane, the charcoal can be eliminated and the polymer increased to fill 2/3 of the trap. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Vent the trap effluent to the room, not to the analytical column. Prior to daily use, the trap should be conditioned for 10 min at 180°C with backflushing. The trap may be vented to the analytical column during daily conditioning; however, the column must be run through the temperature program prior to analysis of samples.

6.2.3 The use of the methyl silicone coated packing is recommended, but not mandatory. The packing serves a dual purpose of protecting the Tenax adsorbant from aerosols, and also of

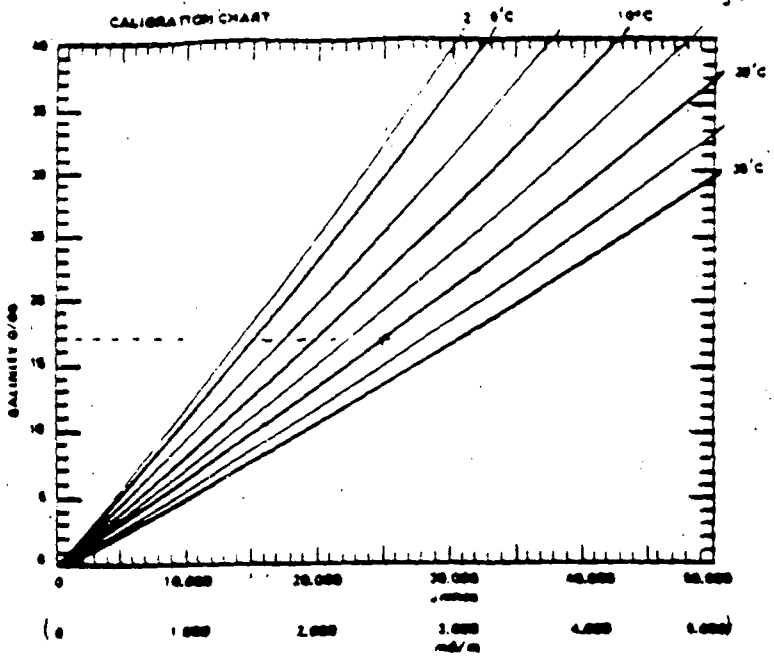


Figure 1. Calibration Chart for Resetting Temperature Knob

4. Remove the °C knob switch to SALINITY, and turn the control shaft until the meter needle indicates the salinity value determined in step 3.

5. Switch to TEMPERATURE. If this temperature is the same as step 2, continue. If not, repeat steps 1 through 5.

6. Place the knob on the control shaft - without turning the control shaft - with the pointer at the same temperature as the meter reading. Tighten both sets of screws securely. Care must be taken at this step so that the shaft setting is not moved.

7. Return the instrument to the factory at the earliest opportunity.

2.1.2 Tempertaure Probe/Instrument

To check the accuracy of the Probe/Instrument temperature readings:

1. Place NBS traceable thermometer in solution with thermometer and probe.

2. Place instrument in temperature mode after zeroing and red lining the instrument.

3. After five minutes, compare temperature of thermometer and instrument. If the instrument varies by ±1C, the instrument should be returned to the factory for calibration and maintenance.

2.2 Probe Cell Calibration

The YSI #3300 Series Cells are calibrated to absolute accuracy of ± 1.5 percent based on a standard solution of 0.01 demol KCl. To prepare this solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.

2. Use Table 1 and the temperature of the water to determine the conductivity of the solution just prepared. Note: Table 1 shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.

3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by ± 1.5%. If the reading is greater than 1.5%, clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solution within ± 1.5%, the probe and instrument should be returned to the manufacturer for calibration and maintenance.

3.0 MAINTENANCE

3.1 Batteries

The batteries should be replaced either (1) when it is not possible to red line the instrument, (2) after 200 hours of operation, or (3) every 6 months to reduce the danger of corrosion due to leaky batteries.

To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The positive (+ button) end must go on red.

Use two "D" size alkaline flashlight cells (Eveready E95 or equivalent).

3.2 Probe

3.2.1 Cleaning

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

TABLE 1 - CELL CALIBRATION DATA

Temperature (°C)	Conductivity (umhos/cm)
15	1141.5
16	1167.5
17	1193.6
18	1219.9
19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaner such as: "Rally, Tile, Porcelain, and Chrome Cleaner"; Johnson Wax "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner".

For storage cleaning, a 5 minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe in distilled water after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is very soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

3.2.2 Probe Replatinizing

1. Equipment required:
   a. YSI #3140 Platinizing Solution, 2 fluid ounce (3% platinum chloride dissolved in 0.025% lead acetate solution)
   b. YSI Model 33 meter
   c. 50 ml glass beaker or equivalent
   d. Distilled water
2. Procedure
   a. Clean probe as in section 3.2.1 - either method

b. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe

c. Plug the probe into the Model 33 and switch to the X100 scale to platinize the electrode

d. Move the probe slightly to obtain the highest meter reading and continue platinizing for the appropriate time shown below:

Meter Reading (umhos/cm)	Time (minutes)
30,000	5
25,000	6
20,000	8
15,000	11
10,000	16

e. After the elapsed time, remove the probe and rinse in distilled water.

f. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

3.2.3 Storage

It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

CALIBRATION AND MAINTENANCE PROCEDURES HAAKEBUCHLER pH STICK

1.0 INTRODUCTION

This procedure presents the steps for calibrating and maintaining the HaakeBuchler pH Stick. Instrument operation principles and procedures and specifications are presented in Procedure 5617003.

2.0 CALIBRATION

2.1 Calibration Solutions

The instrument requires distilled water, a pH 7 buffer solution, and a pH 4 buffer solution for calibration. To prepare the buffer solutions, dissolve the buffer powders provided with the instrument into the volume of distilled water specified on the buffer powder packets. (Note: the manufacturer does not specify whether buffer and pH 4 solutions, other than that provided, may be used as substitute solutions).

The pH of the buffer and pH 4 solutions will vary with the temperature of the solution. Use the table below to determine solution pH based on temperature.

Temp	0°C	10°C	20°C	25°C	30°C	40°C	50°C
pH 4	4.00	4.00	4.00	4.01	4.02	4.04	4.06
pH 7	7.11	7.06	7.01	7.00	6.98	6.97	6.97

2.2 Calibration Procedure

The instrument requires calibration in the field prior to each use. However, as a check of proper instrument function, the instrument should be periodically calibrated in the laboratory,

particularly if the instrument has been stored for an extended period without use.

To calibrate the instrument:

1. Remove the protective sheath and rinse the electrode in distilled water.
2. Place the electrode in the pH 7 buffer solution, depress the white operation button below the LCD display and allow the reading to stabilize.
3. Adjust pH 7 control using the tool on the end of the protective sheath. The pH 7 control is the upper most white control on the right side of the instrument. Adjust the pH control until the meter reads pH 7.
4. Rinse the electrode in distilled water.
5. Place the electrode in pH 4 solution, depress the white operation button, and allow the reading to stabilize.
6. Adjust the slope control (white control below pH 7 control on the right side of the instrument) until the meter reads the correct value of the pH 4 solution.
7. Rinse the probe in distilled water.
8. Repeat steps 2 through 7.
9. Record calibration on the instrument log form.
10. Store instrument properly.

3.0 MAINTENANCE

3.1 Storage

To maintain high accuracy and to obtain a long electrode life, the pH stick must be stored correctly when not in use. Always rinse the electrode in distilled water before replacing it in its protective sheath. The electrode must not be let to dry out.

The absorbent pad at the bottom of the sheath must be kept saturated with a pH 7 buffer solution. If this is not available, distilled water can be used as a temporary measure. Replace distilled water with buffer solution at the earliest possible opportunity. Always place buffer (or distilled water) into sheath following each use.

To retain accuracy and speed of response, the insulation of the connectors on the electrode and the body must be kept clean and dry. This is best assured by not unnecessarily removing the electrode from the body.

When not in use, place the pH stick in the wallet provided and store in a dry place.

3.2 Electrode Cleaning

If rinsing the electrode in distilled water is not deemed sufficient to clean the electrode, it can be cleaned in a N/10 HCl acid solution. Following cleaning in the acid, the electrode should be soaked in a pH 7 buffer solution for 24 hours before rinsing. Record cleaning on instrument's log form.

3.3 Battery

Normal battery life is in excess of 200 hours of continuous use. Cells should be replaced at 2 year intervals or earlier if exhausted (voltage per cell of less than 1.35V). Replacement cells must be mercury type V312H or direct equivalent. When refitting cells, make sure they are refitted in the manner illustrated on the battery housing.

EQUIPMENT AND INSTRUMENT CALIBRATION AND MAINTENANCE, GENERAL REQUIREMENTS

1.0 INTRODUCTION

The general guidelines for calibrating and maintaining instruments and monitoring equipment are presented in this document.

2.0 CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures are documented for each piece of equipment affecting quality. Calibration and maintenance procedures are developed based on manufacturer's specifications and are retained in the Site Investigation Procedures Manual. These procedures include, but are not limited to:

1. Equipment identification (name) and description.
2. Equipment specifications.
3. Calibration and/or maintenance schedule.
4. Equipment necessary to accomplish calibration (where applicable).
5. Procedure for calibration and/or maintenance.

3.0 CALIBRATION LABEL

Instruments requiring calibration and/or maintenance have a prominently displayed sticker containing the following information:

1. Date of calibration and/or maintenance.
2. Next due date for calibration and/or maintenance.
3. Initials of person performing calibration and/or maintenance.
4. Span gas and concentration(s) (if applicable).
5. Span or sensitivity setting (if applicable).

4.0 EQUIPMENT LOG BOOK

An equipment log book is issued to record the life history of each measuring and testing device used in activities affecting quality. This book is a three ring binder in which individual records for each piece of equipment are maintained. A form such as F6101 or a reasonable facsimile should be used to maintain the calibration and maintenance record. The record should include:

1. Equipment identification (name) and control number.
2. Date of calibration and/or maintenance.
3. Condition of equipment.
4. Activity performed on instrument (calibration and/or maintenance).
5. Adjustments made and accuracy of equipment prior to and following calibration (where applicable).
6. Record of equipment failure or inability to meet specifications (where applicable).
7. Initials of person performing calibration/maintenance.
8. Next due date for calibration and/or maintenance.

5.0 CALIBRATION/MAINTENANCE FORM

An instrument specific calibration/maintenance form will be developed to record data relating to each individual calibration/maintenance event. A single form will be used for each calibration/maintenance event. In addition to the data recorded in the calibration/maintenance log, the following items should also be included in the instrument specific form (where applicable).

1. Calibration calculations and curves.
2. Span gas type and concentrations.
3. Span or sensitivity range settings.
4. Specifics on repairs and parts replaced, added, or removed.

5. Instrument's overall condition.

6.0 FIELD CALIBRATION

As part of normal field operations, some instruments require calibration prior to, during, and/or after field use. This field operation calibration should remain separate from pre-field calibrations and should not be used as a substitute for standard calibration activities. Field calibration should be recorded in field log books or on field forms as part of the normal field data collection process. Field calibration records should not be included in the history log.

7.0 INSTRUMENTS NOT IN COMPLIANCE

If the calibration schedule is not adequately maintained, or if accuracy as reported in specifications cannot be attained for a specific instrument, that instrument is labelled "HOLD" and is unavailable for use until it is repaired and specifications are attained.

APPENDIX D

IEPA SAMPLE BOTTLE SUPPLY SERVICE

SECTION B

SAMPLE CONTAINER AND COMPONENT SPECIFICATIONS

SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

Figure B-1 following, designates the specifications for the eight types of containers and the associated materials (i.e., teflon liners, lids, etc.) to be supplied by the Contractor under this contract.

All materials received from vendors shall be subjected to incoming inspection by the Contractor to insure conformance with these established specifications. Variations in materials shall be considered unacceptable. Any materials not in conformance with these specifications shall be returned by the Contractor to the vendor for replacement.

FIGURE B-1

Container Type	Container and Material Specification	Parameter and Sample Type
1	Container: 1 liter* amber, Boston round, glass bottle, 33 mm pour-out neck finish Closure: white polypropylene cap, 33-400 size, .015 mm teflon liner	Extractable Organics
3	Container: 1 liter* natural high-density polyethylene cylinder round bottle, 52g weight, 28 mm neck finish. Closure: baked polyethylene, white ribbed, 28-400 or 28-410 size; unlined lid.	Metals, Cyanide Radioactivity, General, Nutrients, Sulfide
5	Container: 32 oz. tall, wide-mouth straight-sided paragon, flint glass jar, 89 mm neck finish. Closure: white polypropylene cap, 89-400 size, .015 mm teflon liner	Extractable Organics, Oil/ Grease, Metals, Mercury, Cyanide, Nutrients, Phenols, General, Sulfide
7	Container: 8 oz. wide-mouth glass jar	Same as type 5
8	Container: 40 ml borosilicate glass vial, Type 1 glass, 24 mm neck finish. Closure: black phenolic, open-top, screw cap, 15 cm opening, 24-400 size. Septum: 22 mm disc of 2 mil teflon bonded to silicon for total thickness of 125 mil.	THM/VOA
9	Container: 1/2 gallon amber glass, ring handle bottle/jug, 38 mm neck finish. Closure: teflon-lined white propylene cap, 38-400 size.	Extractable Organics

10	Container: 500 ml natural high density polyethylene, oblong bottle, 43 mm neck finish. Closure: white propylene unlined cap, 43-400 size (or 43 mm).	Mercury
11	1 gallon plastic	Prefiltration
12	Container: 2 oz., wide-mouth straight-sided paragon, flint glass jar, 53 mm neck closure: white polypropylene cap, 53-400 size, 0.015 mm teflon liner.	THM/VOA

* These bottles must have sufficient overfill to accommodate an actual capacity of 1 liter of liquid. Bottle manufacturers refer to these bottles as 32 ounce bottles, however all 32 ounce bottles do not have sufficient overfill to meet the requirement.

NOTE: Containers and component material specifications different than, but equivalent to, the manufacturer's specifications cited herein may be acceptable. The bidder shall be required to demonstrate equivalence prior to Government approval of use of alternate materials. The Government shall determine acceptability as part of bidder preaward confirmations (see Pre-Award Bid Confirmations).

SECTION C

CONTAINERS PREPARATION AND CLEANING PROCEDURES

CONTAINER PREPARATION AND CLEANING PROCEDURES

The Contractor shall clean and prepare containers and component materials according to the following procedures specified for each container type.

I. Extractable Organics

Container Types: 1 - 1 liter amber glass
5 - 32 oz glass jar
9 - 1/2 gallon amber glass
7 - 8 oz glass jar

1. The containers, teflon liners and caps are to be washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Dry in oven @ 125°C for one hour.
5. Rinse inside and outside of container with pesticide hexane.
6. Dry containers, liners, and caps in an oven at 125°C for one hour.
7. Allow containers to cool and seal with teflon lined caps.
8. Label each container with color coded labels, with lot number, and pack in a sealable carton.
9. Place identical labels on exterior of carton and store in a designated contaminant-free area.

II. Purgeable Organics:

Container Types: 8 - 40 ml glass vial
12 - 2 oz. glass jar

1. Containers, teflon-backed septa and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Oven dry vials, containers, caps, septa, and teflon-lined lids at 125°C for one hour.

5. Cool in a contaminant-free area.

6. Seal vials with septa (teflon side down) and cap. Seal containers with cap and liner.

7. Label each vial and container with color coded label with lot number, and pack in a carton and seal.

8. Place identical label on outside of carton with respective lot number and store in a contaminant-free area.

III. Metals, Mercury, Cyanide, Radioactivity

Container Types: 3 - 1L high-density Polyethylene
5 - 32 oz glass jar
10 - 250 ml high-density Polyethylene
7 - 8 oz glass jar

1. The bottles and caps are washed in tap water with laboratory grade non-phosphate detergent.

2. Rinse with 50% reagent grade HNO3.

3. Rinse three times with ASTM Type I deionized water.

4. Invert and dry in a contaminant-free area.

5. Cap each container, label with color coded label with lot number and place in a carton.

6. Label carton with the same lot number and store in a contaminant-free area.

IV. Phenols, Nutrients, General, Pre-filtration, Sulfide

Container Types: 3 - 1L high-density Polyethylene
5 - 32 oz glass jar
11 - 1 gallon plastic
7 - 8 oz glass jar

1. Wash containers in tap water with laboratory-grade non-phosphate detergent. Wash caps in a separate wash.

2. Rinse three times with tap water.

3. Rinse three times with ASTM Type I deionized water.

4. Invert bottles and dry in a contaminant-free area.

3. Cap bottles and label with color coded label with lot number and pack a carton.

5. Label the carton with the same lot number and store in a contaminant-free area.

V. Oil and Grease

Container Types: 5 - 32 oz glass jar
7 - 8 oz glass jar

1. The containers, teflon liners, and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.

2. Rinse three times with tap water.

3. Rinse with ASTM Type I deionized water.

4. Dry in oven at 105°C for one hour.

5. Allow containers to cool and seal with teflon lined caps.

6. Label each container with color coded labels with lot number and pack in a sealable carton.

7. Place identical labels on exterior of carton and store in a designated contaminant-free area.

SAMPLING and ANALYSIS PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION OPERABLE UNIT FINAL SAMPLING AND ANALYSIS PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
REMEDIAL PROJECT MANAGEMENT SECTION
FEDERAL SITE MANAGEMENT UNIT
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

JUNE 1990

PROJECT NO: 1681-3-CG-GEAD

16814/02.1

SAMPLING AND ANALYSIS PLAN

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

This Sampling and Analysis Plan (SAP) describes the field activities required for the Operable Unit in the Southeast Rockford Groundwater Contamination Area. The objectives of the sampling program are as follows:

- Determine the need for an alternate water supply in areas affected by the contaminant plume;
- Obtain water quality data from residential and industrial wells in areas where gaps currently exist;
- Evaluate current risks to public health resulting from the contaminated groundwater; and
- Acquire information needed to assess feasible remedial actions.

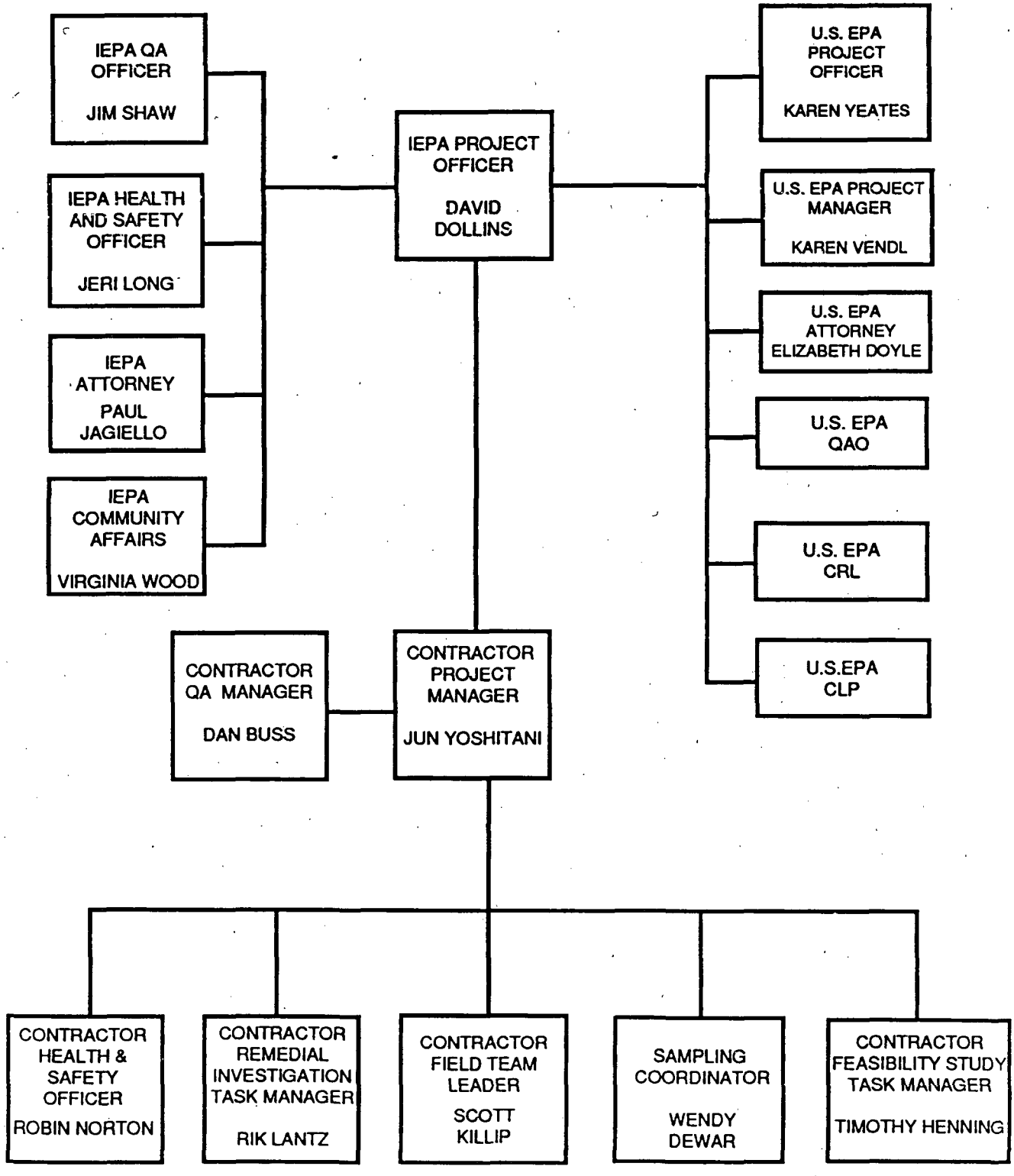
1.2 SAMPLING TEAM RESPONSIBILITIES

Field sampling will be performed by Camp Dresser & McKee (CDM). The Field Operations Organization is shown in Figure 1-1. Responsibilities of the sampling team are described below.

Field Manager

The Field Manager (FM) (in conjunction with the Site Manager), will be responsible for assigning responsibilities to members of the sampling team, as well as overseeing all field activities. The FM will coordinate mobilization and demobilization for the sampling team, as well as for any subcontractors. The FM will be responsible for keeping the Site Manager up to date on all sampling and subcontractor activities.

FIGURE 1-1
SOUTHEAST ROCKFORD OPERABLE UNIT
ORGANIZATION CHART



Sampling Team Leader

The Sampling Team Leader (STL) will be responsible for the sampling activities, will assure the availability and maintenance of all sampling equipment and materials, and will maintain an adequate supply of shipping and packing materials. The STL will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of field log books, and provide close coordination with the Field Data Coordinator (FDC) and the Field Manager (FM). The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will perform field measurements, collect samples, prepare samples for shipping, and decontaminate sampling equipment, as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will remain in the Support Area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control forms. The FDC will also be responsible for maintaining communications with on-site personnel and off-site laboratory personnel, as well as for logging all communications and site entries and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is also responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety

Assurance Manual and site Health and Safety Plan. The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

Safety Technician

The Safety Technician (a designated member of the sampling team) will aid other Sampling Team Members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculate, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

1.3 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities covered by this plan include the collection and analysis of 204 samples: 155 of these samples are investigative, 17 are field duplicates, 15 are trip blanks and 17 are field blanks. Samples will be collected from residential, municipal and industrial wells. The sampling and analysis program, including specific parameters which will be analyzed and quantity of quality control samples, is summarized in Table 1-1. Samples will be collected over a period of two weeks.

TABLE 1-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

			QA Samples								Matrix
			Investigative Samples			Field Duplicate			Field Blank		
Sample Matrix	Field Parameters	Laboratory Parameters	No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	Total
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	144	1	144	15	1	15	15	1	15	174
		SAS for metals from CLP[2]	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	1	1	1	1	1	1	1	1	1	3
		SAS for metals from CLP[2]	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP[1]	10	1	10	1	1	1	1	1	1	12
		SAS for metals from CLP[2]	10	1	10	1	1	1	1	1	1	12

* A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

** One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

[1] CLP SAS volatile parameters are listed in Table 5-1 of the QAPP.

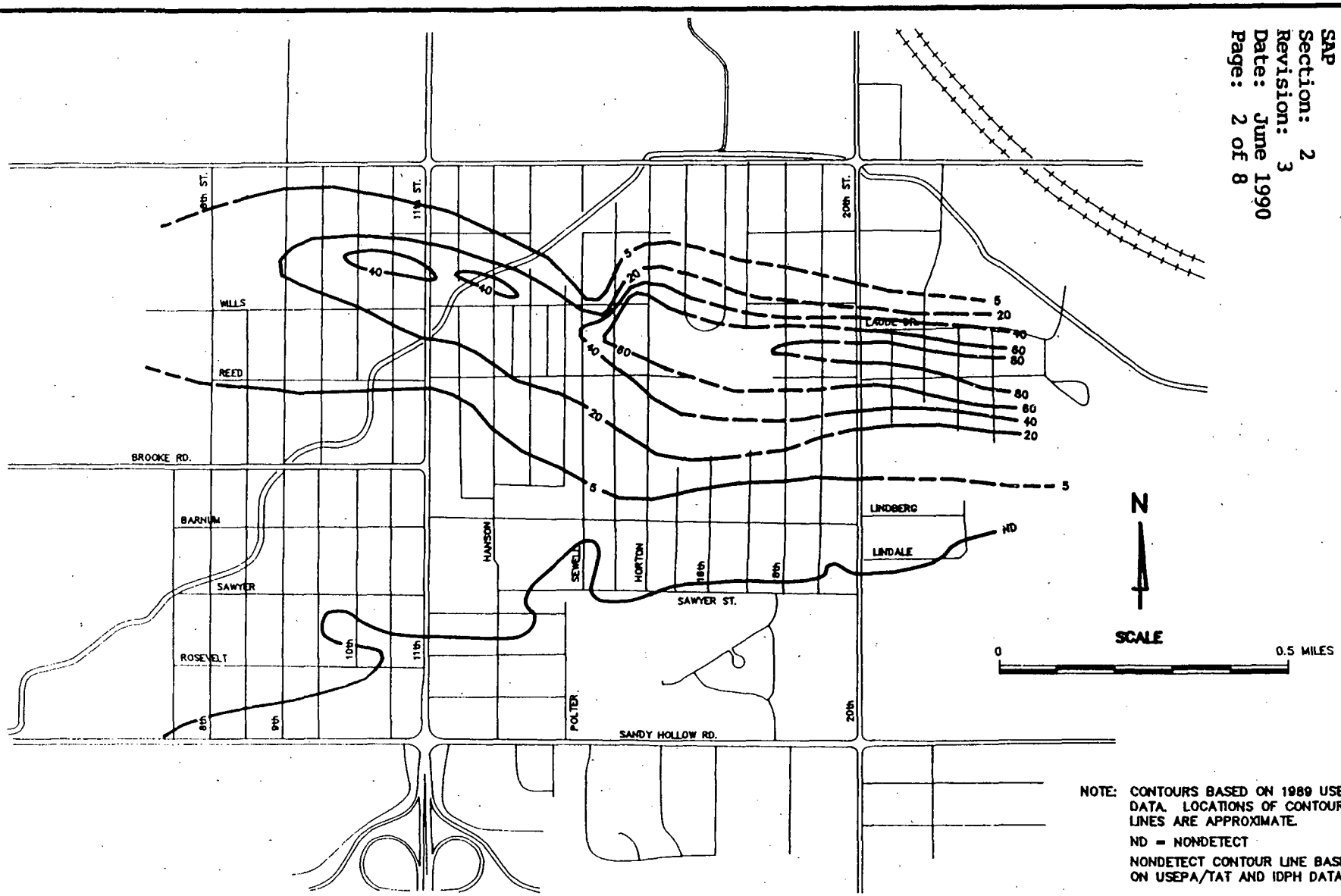
[2] CLP SAS metal parameters are listed in Table 5-2 of the QAPP.

2.0 SAMPLE LOCATIONS AND RATIONALE

Because IDPH has sampled the Southeast Rockford area extensively since 1984, as discussed in the Work Plan, the IDPH data set was considered along with the TAT data set, in determining the current concentrations of contaminants across the study area. Movement of contaminant plumes throughout the subsurface can cause concentrations to vary with time, as measured at a single location, such as a private well. In order to minimize any potential effects related to temporal variations in contaminant concentrations, only data from 1988 to the present was considered in this study. The existing data in conjunction with the information provided by the IEPA well survey was used to design the sampling network described below. Figure 2-1 shows the current contaminant plume as defined by the existing data.

2.1 RESIDENTIAL WELL SAMPLING

CDM proposes to collect 144 investigative samples (not including QA/QC samples) from residential wells in the study area to complement the USEPA/TAT and IDPH data and to more accurately define those residences affected by groundwater contamination. The principal objective of the sampling during the Operable Unit is to identify residential wells in the study area that 1) are contaminated at levels between the MCLs and the method detection limits for the contaminants of concern; 2) are not currently served by municipal water; and 3) will not be served by the extended watermains to be installed by the USEPA. An additional objective of sampling is to maximize data coverage by avoiding resampling of residences that have been previously sampled. Therefore, the proposed sampling locations are concentrated outside of the known plume area (areas that were not sampled during previous studies or areas where previous sampling indicates variable contaminant concentrations). However, a small amount of resampling of residences previously sampled by IDPH is proposed



NOTE: CONTOURS BASED ON 1989 USEPA DATA. LOCATIONS OF CONTOUR LINES ARE APPROXIMATE.

ND = NONDETECT

NONDETECT CONTOUR LINE BASED ON USEPA/TAT AND IDPH DATA.

CDM

environmental engineers, scientists, planners, & management consultants

TCE CONCENTRATION IN PRIVATE WATER WELLS (in ug/l)

FIGURE NO. 2-1

(approximately 7 percent of the number of investigative samples) to assess plume movement, seasonal effects, and to verify comparability of data from the current study with data from previous studies.

IEPA has conducted a residential well survey to identify residents in the study area that may use private wells to obtain potable water. The survey was conducted by directly sending questionnaires to residents that may be affected by the groundwater contamination. The survey coverage is not complete; areas south of Sawyer Road were not contacted, and no response to the survey was obtained for about 25 percent of the residences in the area covered by the survey. The area south of Sawyer Road is currently being addressed by IEPA by the ongoing residential well survey. The existing survey data is the most current and applicable data regarding existence of private water supply wells in the area, therefore the survey results were the primary resource used to determine proposed sample locations for the IEPA Operable Unit. The survey results as of April 4, 1990 were used to determine the sample locations.

In areas where the IEPA residential well survey did not provide information on the use of private wells, city of Rockford billing records supplied by Virginia Wood of IEPA were used to determine private well use. Because of known inaccuracies in the billing records, some sample locations in the area south of Sawyer Road were selected in areas where the billing records indicate that there may be no private wells, in order to achieve adequate sample coverage. In those areas, locations of private wells will be identified by the residential well survey currently being conducted by IEPA. Existence of private wells will be confirmed in the field prior to collecting samples.

A third source of information used in selecting sample locations was previous sampling events by IDPH and USEPA/TAT. Residences that hve been sampled by USEPA were identified from chain-of-custody records and residences sampled by IDPH were identified from a database listing provided

by Clay Simonson of IDPH. Residences that have been sampled since 1988 were avoided in the proposed sample locations. However, in order to assess data comparability and potential plume migration, an overlap of approximately 7 percent was allowed between residences previously sampled by IDPH and proposed sample locations.

Finally, the area within the plume as defined by the existing data, areas to be served by the USEPA Removal Action proposed water main, and residences previously sampled by USEPA have been excluded from the proposed sample locations. The area to be addressed by the Removal Action has been determined based on a map provided by USEPA.

Using these sources of information, a list of proposed sample locations was developed, which is included as Table 2-1. A map of proposed and existing sample locations is included as Plate A attached to the back cover of this document. Because of the inaccuracies inherent in the database regarding locations of private wells in the study area, these sampling locations should be considered tentative, and may be modified in the field depending on access, the presence of private wells, and other factors. Any remaining data gaps or inaccuracies in the proposed sampling locations will be addressed in the field by a door-to-door survey. Alternate sample locations will be chosen as close to original locations as possible.

In order to achieve sample coverage in a cost-effective manner within the areas to be sampled, a total of 144 investigative sample locations are proposed, which will define the horizontal extent of groundwater contamination within a lateral resolution of one block or better. Because the depths of the screened intervals for private wells at the proposed sample locations are not known, it is not anticipated that the proposed samples will define vertical extent of groundwater contamination. This information will be requested during sampling, but it is doubtful that local residences will have this information.

Table 2-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address	Street	Address	Street	Address
4th	2805	11th	3015	Brooke	106
4th	2820	11th	3119	Brooke	202
4th	2917	11th	3208	Brooke	326
4th	3011	11th	3215	Brooke	411
4th	3045	11th	3301	Brooke	430
5th	2604	11th	3329	Brooke	613
7th	3115	15th	3135	Brooke	823
7th	3221	16th	3102	Brooke	914
7th	3305	16th	3122	Brooke	1101
7th	3337	17th	2602	Brooke	1202
8th	2914	17th	3120	Brooke	1317
8th	3009	17th	3141	Collins	2801
8th	3109	18th	3110	Collins	2825
8th	3138	19th	2622	Collins	3029
8th	3201	20th	2703	Collins	3109
8th	3237	20th	2717	Collins	3126
8th	3301	20th	3109	Collins	3245
8th	3337	Barnum	305	Collins	3310
9th	2624	Barnum	409	Fitch	407
9th	2730	Barnum	505	Fitch	507
9th	2808	Barnum	611	Fitch	601
9th	2842	Barnum	825	Fitch	807
9th	2927	Bildahl	3009	Grant	3045
9th	3102	Bildahl	3017	Grant	3107
9th	3210	Bildahl	3038	Hamilton	1735
9th	3245	Bildahl	3122	Harrison	733
10th	2627	Bildahl	3141	Harrison	1001
10th	3110	Bildahl	3206	Harrison	1713
11th	2613	Bildahl	3302	Harrison	1817
11th	2955	Bildahl	3338	Harrison	2315

Table 2-1: SE Rockford Operable Unit
Proposed Sample Locations

Street	Address
Johnson	1737
Kennon	315
Kennon	415
Kennon	517
Kennon	621
Kishwaukee	3037
Kishwaukee	3112
Kishwaukee	3302
Kishwaukee	3336
Lapey	3013
Lapey	3038
Lapey	3137
Lapey	3213
Lapey	3230
Lapey	3325
Lindale	2406
Lindale	2620
Lindberg	2412
Lindberg	2619
Lyran	1616
Lyran	1701
Marshall	3125
Marshall	3137
Martin	430
Martin	508
Martin	618
Mattis	827
Olsen	2812
Pershing	1637
Pershing	1726
Ranger	801
River Blvd.	3007
River Blvd.	3117
River Blvd.	3125
Rock Riv. Ave	508
Roosevelt	843
Sandy Hollow	728
Sandy Hollow	826
Sandy Hollow	1202
Sandy Hollow	1306
Sandy Hollow	1820
Saner	2905
Saner	3011
Saner	3110
Sawyer	319
Sawyer	407
Sawyer	525
Sawyer	615
Sewell	2622
Sewell	2646
Sewell	3137
South	527
South	619
Taft	801

In the area west of 8th Street proposed sample locations were selected with a sample density of one sample per block. Because the residential well survey has not yet been completed, some proposed sample locations were chosen at residences where existence of a private well has not yet been confirmed. Consequently, it may be necessary to adjust these sample locations in the field. In this event, the target sample density of one sample per block will be maintained if possible. There is very little existing data in this area, therefore it is felt that a distribution of one sample per block is necessary to define the plume. This distribution alsoassumes that if water mains are installed in this area as part of the Operable Unit they will extend the entire length of the block because it will not be possible to determine any mid-block cutoffs with one sampling point per block.

In the area east of 8th Street, proposed sample locations were chosen by CDM in conjunction with IEPA and USEPA. For the purposes of this investigation, it has been assumed that existing USEPA/TAT and IDPH data adequately define the plume of VOC-contaminated groundwater at TCE concentrations greater than or equal to the MCL (5 ppb). All proposed sample locations have therefore been selected outside the 5 ppb TCE contour (Figure 2-1). The TCE plume was chosen to represent the extent of groundwater contamination by VOCs because the area represented by the plume of groundwater contaminated at levels exceeding the MCL for TCE encompasses all areas exceeding the MCL for the other VOCs detected at the site.

In those areas outside of the plume east of 8th Street, sample locations were selected based on existence of data gaps, presence of private wells, and previous sampling episodes. Within the constraints of these parameters, a sampling density of 1 to 2 samples per block was established as a goal, with the greater sample density concentrated near the margins of the plume. In this area it may be possible to have better lateral definition of the affected blocks by using a combination of existing and new data. This will be dependent on the degree of data comparability between the sampling events.

Figure 2-1 also shows the approximate contour line for homes with TCE values below detection limits based on existing IDPH and USEPA/TAT data. This line should be considered approximate because the data collection dates extend over two years (1988 and 1989) and the detection limits and analytical methods used have not been defined. The area east of 11th Street has been more extensively sampled than that area between 8th and 11th Streets. Therefore, a distribution of approximately one residence per block east of 11th Street and a distribution of two residences per block between 11th and 8th Streets were chosen based on the distribution of existing data. Sample locations have been selected both inside and outside the non-detect contour line. The sampling in areas outside the non-detect contour line is warranted in order to assess the extent of the metals contamination and in order to assess the cumulative health risks associated with the target volatile compounds (including TCE) that may be present at levels below the detection limits of the existing data.

2.2 INDUSTRIAL WELL SAMPLING

A review of aerial photographs indicates that there are approximately 26 sizeable industrial operations in the study area. Based on results of the response to the IEPA well survey, CDM will determine whether any of these industries are using groundwater as a potable water source. Only those industries using private wells for potable water will be sampled. It is anticipated that groundwater samples will be collected from a maximum of 10 industrial locations. Selection of industries to be sampled will be based on location with respect to the contaminant plume and accessibility of sampling, in addition to the requirement that the groundwater is used for potable water.

2.3 MUNICIPAL SUPPLY WELL SAMPLING

In addition to sampling residential and industrial wells, a sample from Municipal Supply Well 35, located at 2944 Bildahl, will be collected. This sampling will be conducted to provide information for subsequent FS tasks.

3.0 SAMPLING PROCEDURES

3.1 SAMPLE COLLECTION

The sampling procedure for residential, industrial and municipal wells for metals and VOC analysis is briefly summarized as follows:

- The closest accessible sampling point to the well (sink faucet, influent valve for water softener, etc.) will be fully opened and allowed to purge until a stable water temperature is attained. This will be determined by direct measurement of the flowing water with an electronic thermometer on one-minute intervals. Once the flowing water has stabilized to $\pm$ 0.5°C for three consecutive measurements, the water temperature will be considered stable and sampling will commence.

- Every attempt will be made to sample a point of influent closest to the well in order to bypass any carbon filtration, water softening system, or any other influent purifying or filtration system. In the event that an influent sampling point cannot be located before the influent is treated by a water purifying system, the point of sampling and the type of purification system(s) will be documented in the field notebook.

- Because these samples will be collected from sample points prior to any treatment (such as chlorination) it will not be necessary to test for the presence of chlorine in the samples.

- pH, specific conductivity and temperature will be measured and recorded in accordance with procedures described in Appendix A to this Sampling Plan. A flow rate of approximately 100 ml/minute (as measured with a graduated cylinder and a portable timepiece)

will be attained and an appropriate number of decontaminated 40-ml VOA bottles will then be slowly filled, leaving no headspace (air bubbles) in the sample bottle. Care will be taken during filling the sample bottles to avoid agitation of the water. No chemical preservatives will be added to VOA samples.

- After filling the sample bottle, the cap will be securely tightened and the bottle will be inverted and tapped firmly on the heel of the hand. If bubbles are visible, the bottle will be emptied and a new sample will be collected.

- Following sample collection for VOC analysis, the water flow from the tap will be increased to a nominal rate and a one-liter polyethylene sample bottle will be filled with tap water to a level equal to the shoulder of the sample bottle.

- Nitric acid (HNO_3) will be added as a preservative to the sampled water in the amount necessary to reduce the pH of the water to <2. The pH of the sample will be tested with litmus paper on all samples collected for metals analysis.

- The filled sample bottles will be decontaminated by rinsing with deionized water.

- The sample bottles will be sealed in a zip-lock bag and immediately placed in an iced cooler.

- Surgical gloves will be worn by the sampler while collecting the sample to avoid cross-contamination.

If the industrial or municipal wells have been pumping within the last 6 hours they will be purged using the same procedure as for the residential wells. If a well has been inactive for more than 6 hours, the effort will

be made to pump the well until the system piping has been purged. An estimate of system volume will be made and temperature will be used to determine stabilization as previously described. Once the system is purged/stabilized, the sample will be collected using the previously described procedure. As with residential sampling, all efforts will be made to collect a sample prior to any treatment or filtration.

Further details of sampling procedures for the collection of water samples from residential water supplies are described in Appendix B to this Sampling Plan.

3.2 SAMPLE CONTAINERS AND PRESERVATION

Four 40-ml glass VOA bottles for VOC analysis and one 1-liter polyethylene sample bottle for total metals analysis will be collected at each sample location, in accordance with the October 27, 1989 USEPA Region V Sample Handling Manual. Sample bottles and vials will be supplied by the IEPA Sample Bottle Repository. Samples will be analyzed by a laboratory certified by the Contract Laboratory Program (CLP). At sample sites where duplicate samples will be collected, double sample volume (eight 40-ml glass vials and two 1-liter polyethylene bottles) will be supplied to the lab for analysis. At sample sites where matrix spike/matrix spike duplicates (MS/MSD) are collected, eight 40-ml glass vials will be supplied to the lab for analysis. No additional sample volume of water for metals analysis will be required or supplied to the lab for MS/MSD analysis. Samples for VOC analysis will not be preserved with HCL but will be chilled in an iced cooler to a temperature of 4°C. Samples for metals analysis will be preserved with nitric acid to a pH<2 (approximately 5 ml 1:1 nitric acid per bottle) and will not require cooling.

Sample collection, containerization and preservation will be performed in accordance with procedures in the USEPA Sample Handling Manual, contained in Appendix C to this Sampling Plan.

3.3 SAMPLE HOLDING TIMES

The respective sample holding time for drinking water analysis for volatile organics and total metals is 7 days and 6 months from sample collection to analysis. To expedite sample analysis, the samples will be shipped to the laboratory via an overnight carrier (i.e., Federal Express) on the day the samples are collected.

3.4 SAMPLE PACKAGING AND SHIPMENT

Following sampling, the sample bottle exteriors will be decontaminated near the sampling location, or rinsed with potable or distilled water prior to shipment. The Field Manager will help the Field Data Coordinator prepare documentation and package the bottles for shipment according to the following procedures:

- Ensure that the sample is properly preserved; tighten cap securely.
- Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material and maintain at 4°C with cold packs, or ice sealed in plastic bags (for VOC samples); fill remaining space in cooler with additional packing material.
- Put chain-of-custody forms and traffic reports in a zip-loc bag and tape to inside of cooler lid.
- Close cooler and seal with strapping tape; if cooler has a drain port, seal it with tape; place one custody seal across closure at front of cooler and across hinge area at back of cooler, or rear side corner.
- Affix airbill with shipper's and cosignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.

The Field Manager will contact the Sampling Coordinator to confirm sample shipment dates two weeks in advance for Special Analytical Service (SAS) analyses to CLP. The Field Manager will notify the Sampling Coordinator of any last minute changes in the sampling schedule.

Upon shipment of samples to the Laboratory, the Field Data Coordinator will call the Sampling Coordinator (before 5:30 p.m. Central Standard Time on the day of shipment, or early the following morning). The Sampling Coordinator must be notified by 2:00 p.m. on Friday for shipments to the CLP for Saturday delivery/pick-up. The Sampling Coordinator will be provided with the following information:

1. Case and/or SAS numbers (if applicable);
2. Name of laboratory(ies);
3. Date of shipment;
4. Carrier, airbill number;
5. Number and matrices of samples shipped; and
6. Information regarding changes and delays pertaining to the activity.

The Sample Identification Record form will be used to record this information. A copy must be sent to the Sampling Coordinator with the other sample documents, which include copies of the CRL Basic Data forms or SAS Packing List, and Chain-of-Custody forms.

The Central Regional Laboratory Sample Data Report form for samples being sent to the CLP must also be sent to the Sampling Coordinator. These forms are not sent to the CLP.

3.5 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody will be maintained throughout the sample preparation procedure as described in the Quality Assurance Project Plan (QAPP), Section 7.0.

- All information required on the custody tag, including the signatures of the sampling team leader and a predesignated location description, will be filled out in the field.

- Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which the team leader must sign.

- The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.

- The technician will package the samples for shipment ensuring that all traffic reports, chain-of-custody records and custody seals are cross-referenced and recorded on the Sample Identification Record Form and that all sample documentation paper work is enclosed.

- If VOC samples are stored temporarily, prior to shipment, they will be kept cool (4°C) and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

3.6 DOCUMENTATION

This section outlines the documentation required for all field activities and sample shipment to be conducted during the Operable Unit Field Activities.

3.6.1 FIELD LOG BOOKS

Field log books will provide the means of recording data collected during the performance of RI activities. As such, entries will be described in as

much detail as possible so that site personnel can reconstruct a particular situation without sole reliance on memory.

Field log books will be bound, field survey books. Log books will be assigned to field personnel, and stored in the document control center when not in use. Each log book will be identified by the project-specific document number.

The title page of each notebook will contain:

- Person or Organization to whom the book is assigned;
- Book Number;
- Project Name;
- Start Date; and
- End Date.

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, name of all team members present, level of personal protection being used, and the signature of the person making the entry will be recorded. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book. At the end of each day's activity, the log will be closed with the time and signature of the person making the last entry (log-closed line). The log-closed lines and the following log-open lines will be placed so that no unauthorized entries can be made in-between. A typical format is presented in Figure 3-1.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark.

Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which may include compass and

FIGURE 3-1

TYPICAL FIELD NOTEBOOK ENTRY FORMAT

LOG-OPEN TIME: _____ DATE: _____

SIGNATURE: _____

WEATHER: _____

FIELD PERSONNEL: _____ _____

LEVEL OF PERSONAL PROTECTION: _____

EQUIPMENT (NAME/CONTROL NO.): _____

Calibration Date: _____

Station No./Location Description: _____

Film Roll Number: _____ Photograph Numbers: _____

Station No. _____ (Parameter (Units) _____

Sampling Equipment: _____

No.	Time	Sample Description	Depth	Number	Volume	Chest No.	Comments

distance measurements, shall be recorded. The number of the photographs taken of the station with a brief description and the direction faced will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected according to the procedures documented in the SAP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of sample containers. Sample location identifiers will be assigned prior to sample collection. Duplicates, which will receive a separate CRL sample number, will be noted under Sample Description.

3.6.2 SAMPLE IDENTIFICATION SYSTEM

U.S. EPA CRL SAMPLE NUMBER

Each sample will be assigned a U.S. EPA CRL sample number, regardless of the laboratory to which it is sent. The CRL sample number will consist of nine alphanumeric characters, as follows:

90RS01xyy

The first six characters (90RS01) will remain constant for RI sampling.

- 90 Fiscal year 1990
- R Indicates samples sent by CDM
- S Designates project manager
- 01 Designates survey number

The last three characters will vary during the sampling survey. The character "x" is a single digit alpha code designating the type of sample:

S Sample
D Duplicate sample
R Blank sample

The character "yy" is a 2-digit (01 through 99) number designating the sample number. After 99 samples have been collected for the survey, the survey number (characters 5 and 6) is changed. For S-type samples, "yy" is used to consecutively number samples taken during this survey. For duplicate (D-type) samples, "yy" is the same as the sample number of which it is a duplicate. For blank (R-type) samples, "yy" is the consecutive number of blank samples taken during this survey.

EXAMPLE U.S. EPA CRL SAMPLE NUMBERS

- 90RS01S01, 90RS01S02, 90RS01S03
  Samples No. 01, 02, and 03 of Clark's Survey No. 1.

- 90RS01D02
  Duplicate sample of Sample No. S02.

- 90RS01R01, 90RS01R02
  Blank sample No. 01 and 02.

The sample identification number(s) will be recorded in the field log book and on all other paperwork and labels and will be cross-referenced to chain-of custody and pertinent shipping documents. A description of the sample location will be entered into the field log book, including compass directions and distances from reference points, if applicable.

SAMPLE LOCATION IDENTIFICATION

For this project, samples will be collected from residential, industrial and municipal wells for the purpose of determining if the water exceeds drinking water standards. Each sample will be identified by the property address where the well is located. All sample location addresses will be recorded in the field notebook. The Sample Identification Record Form (Figure 3-2) will also be used for computer tracking and identification of each sample. All proposed sample locations and associated address identifiers are shown on Table 2-1.

The sample CRL number and traffic report or SAS number will be cross-referenced to the address location of the sample as recorded in the field book. Sample duplicates and matrix spike/matrix spike duplicates will be marked on the USEPA CRL sample documentation as described previously in this section.

3.6.3 SAMPLE DOCUMENTATION FORMS

Sample documentation required by the U.S. EPA are numbered and will be accounted for. If a document is voided, it should always be saved and returned it to the Sample Coordinator. Copies of the multiple-copy forms must accompany samples to the laboratory. The other copies must be sent to the Sampling Coordinator immediately following sampling shipment.

A) Chain-of-Custody Form

1) One form per shipping container (cooler) will be used.

2) Carrier service does not need to sign form if custody seals remain intact.

3) Will be used for all samples.

FIGURE 3-2

SAMPLE IDENTIFICATION RECORD FORM

SITE NAME ____________________ SITE NUMBER __________

Case Number	Matrix	Lctn	CRL Number	Traffic Report SMO Number	Chain of Custody	Lab Code	Date Sampled	Date Shipped	Airbill Number	Sample Tag Numbers

WHEN FILLING OUT SAMPLE IDENTIFICATION RECORD FORMS:

1) ONLY ONE CASE NUMBER PER SAMPLE ID RECORD FORM

2) LIST TRAFFIC REPORT (SMO) NUMBERS IN NUMERICAL ORDER
(DO NOT LIST ACCORDING TO CRL NUMBERS)

B) Chain-of-Custody Seals

1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with.

2) Seals will be covered with clear tape.

3) Seal numbers will be record numbers on Chain-of-Custody Form.

4) Seals will be used for all samples.

C) Special Analytical Service Packing List

1) Up to twenty samples can be listed per form.

2) Will be used only for samples sent to CLP for SAS analysis.

3) Samples are numbered using the SAS number assigned by CLP followed by a hyphen and progressive numerical designations, beginning with 1 (e.g. 2000E-1, 2000E-2, 2000E-3, etc.)

4) If sampling extends over several days and more than one PL is used, care must be taken to not repeat sample numbers.

5) Sampler will include bottom 2 copies of form with sample shipment; top copy will be returned to SMO and the second copy will serve as the sampler's file copy.

D) Sample Tags

1) Each sample container will have a Sample Tag affixed to it with string or wire.

2) Traffic Report number and Case Number will be recorded in the "Remarks" section of the tag.

3) Sample Tag Numbers will be recorded on the Chain-of-Custody Forms.

4) Will be used for all samples.

E) CRL Sample Data Report

1) Will be completed for all CLP samples.

2) For samples sent to CLP Laboratories, these forms will be sent to Sampling Coordinator to be forwarded to the RSCC.

3) The forms will be necessary for the U.S. EPA to track the samples and ensure data validation.

F) Sample Identification Record Form

1) Will provide a means of recording crucial sample shipping and tracking information.

2) This form will be maintained for each sample shipment and forwarded to Sampling Coordinator upon sample shipment.

All paperwork accompanying the samples being shipped to the CLP laboratories will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the chain-of-custody forms, and other paperwork (if possible) will be retained for the field files.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag number, SAS numbers, analyses to be performed, custody seal number, shippers' airbill numbers, and consigned laboratories,

in a bound log book using black ink and on the Sample Identification Record Forms. For more details on sampling paperwork, refer to the "User's Guide to the Contract Laboratory Program", USEPA, Washington D.C., December 1986 and the excerpt from the USEPA Sample Handling Manual in Appendix C.

4.0 DECONTAMINATION PROCEDURES

Procedures to be followed to decontaminate equipment and personnel will be fully described in the SE Rockford Health and Safety Plan. The procedures are summarized below.

4.1 PERSONNEL DECONTAMINATION

Since sampling will be of drinking water samples, no work zones are anticipated. All necessary decontamination procedures will be conducted in accordance with the protocols set forth in the Site Health and Safety Plan.

4.2 EQUIPMENT DECONTAMINATION

Since sampling will be of drinking water samples, no equipment decontamination is anticipated.

4.3 SAMPLE BOTTLE DECONTAMINATION

Sample bottles for shipment to the laboratories will be decontaminated by rinsing the exterior with potable or distilled water. Solvents will not be used to wash sample bottles.

4.4 STORAGE AND DISPOSAL OF RI GENERATED WASTES

The sampling activities are not expected to generate solid and liquid "waste".

5.0 FIELD QUALITY CONTROL PROCEDURES

To ensure the level of data quality required for Superfund Remedial Investigations, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in Table 5-1.

Field Duplicates

One duplicate sample will be collected for every 10 samples (or portion thereof) collected in the field. Duplicate samples will be collected at the same sample volume and in the same type of container as the other samples.

Field Blanks

One field blank water sample will be prepared for every ten samples collected. Field blanks will be prepared by filling water sample bottles with reagent grade distilled water to the same volume as the drinking water samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field book log.

Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each sample shipment for volatile organic analysis. The trip blank will consist of 3 40-ml VOA vials filled with reagent grade distilled water. The trip blank shall be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CRL or CLP without being opened. The trip blank will be documented on a SAS report form for a shipment being sent to the Contract Laboratory Program. The trip blank

will be documented on the chain-of-custody form and on the CRL Data Form for a shipment being sent to the CRL.

Matrix Spike and Matrix Spike Duplicates (MS/MSD

One sample out of every 20 (or portion thereof) will be collected for MS/MSD analysis. Eight 40-ml VOA vials of water will be collected for each matrix spike sample, as specified in the USEPA Region V Sample Handling Manual. No additional sample volume will be required or supplied to the lab for MS/MSD metals analysis. The matrix spike sample will be denoted by the sample number followed by an -MSD suffix on sample tags, chain-of-custody forms, and other appropriate sample paperwork.

Table 5-1: Summary of QC Sample Requirements

Sample Type	Sample Volume	Frequency	No. of Samples
Residential Well	4-40 ml VOA vials 1-1 liter poly bottle	N/A	144
Industrial Wells	4-40 ml VOA vials 1-1 liter poly bottle	N/A	10*
Municipal Well	4-40 ml VOA vials 1-1 liter poly bottle	N/A	1
Duplicate	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
Field Blank	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
Matrix Spike Duplicate	8-40 ml VOA vials	1:20	10
Trip Blank	4-40 ml VOA vials	1 per shipment	15*

* Approximate

APPENDIX A

PROCEDURES FOR MEASUREMENTS OF pH, SPECIFIC CONDUCTANCE, AND TEMPERATURE OF WATER SAMPLES

Field Measurement of pH in Water

1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occuring at the sampling location.

2. Summary of Method

The pH of water is determined using a portable, field pH meter with a temperature-compensated combination electrode.

3. Apparatus

A) Hoake Buchler pH Meter Stick
B) 100 ml disposable beakers

4. Reagents

A) pH reference buffer solutions:

1) pH = 4.00 $\pm$.01
2) pH = 7.00 $\pm$.01
3) pH = 10.00 $\pm$.01

B) distilled water

5. Sample Handling and Preparation

Sample aliquots for pH measurement should be obtained directly from the sampling point in 100 ml disposable beakers.

6. Calibration

Calibrate the meter/electrode using two reference solutions that bracket the expected pH of the sample. Reference solutions should be at room temperature. Immerse the electrode in pH 7.00 solution and adjust the meter as needed. Remove and rinse the electrode and repeat using the second buffer solution. Repeat adjustments until readings are within 0.05 pH units of the reference values. For additional information see SIPM Method 6617003.

7. Procedure

Immerse the electorde in the water while gently agitating. After about one-half minute, record the pH reading to the nearest 0.05 units -- provided the meter readings are not fluctuating more than ±0.03 units. Be sure that temperature compensation has been provided for. Remove and thoroughly rinse the electrode with distilled water. Repeat the measurement procedure until four readings have been obtained. For additional information see SIMP Method 5617003.

8. Interferences

Prolonged immersion of the electrode in turbid solutions can lead to plugging of the liquid junction and erratic meter readings. The electrode should be cleaned by gently blotting with a lab tissue and rinsing with distilled water.

9. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed electrode in each of the reference buffer solutions used to calibrate the meter/electrode prior to sample measurements. If the readings are not within 0.05 units of the reference values, recalibrate the meter/electrode and re-do the measurement of the sample just tested.

10. Assessment of Precision

Calculate the mean and standard deviation of the four replicate measurements. If the standard deviation is greater than 0.1 units, re-do the measurement of the sample just tested including calibration and verification.

11. Reporting

Report the average value of the replicate measurement to the nearest 0.1 units.

Field Measurement of Specific Conductance and Temperature

1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occuring at the sampling point.

2. Summary of Method

The specific conductance and temperature of water is determined using a portable, field conductivity meter having manual temperature compensation.

3. Apparatus

A) YSI Model 11 S-C-T Meter with weighted probe.
B) 100 ml disposable beakers

4. Reagents

A) 0.01 N KCL reference solution
B) distilled water

5. Sample Handling and Preparation

Sample aliquots for specific conductance and temperature should be obtained directly from the sampling point in 100 ml disposable beakers.

6. Calibration

Calibrate the thermometer in the probe against the field thermometer. Readings should be within ± 1°C. Calibrate the specific conductance meter using the 0.01 N KCL reference solution. The specific conductance of this solution is 1413 umhos/cm at 25°C. Adjust the meter as needed. Temperature calibration should be performed weekly. Specific conductance calibration should be performed daily during the period of use. For additional information see SIPM Method 6617002.

7. Procedure

Check battery condition by turning selector dial to "Red Line". Adjust meter as needed. Immerse the probe in the beaker while gently agitating. Turn selector dial to "Temperature" and record temperature to nearest 0.5°C. Adjust manual temperature compensation dial to temperature of water. Turn selector dial to "Conductivity" at the scale range appropriate to sample conductance. Record specific conductance to three significant digits. Remove and thoroughly rinse the conductance probe and repeat measurements until four sets of readings have been obtained. For additional information see SIMP 5617002.

8. Assessment of Precision

Calculate the mean and standard deviation of the four specific conductance measurements. If the standard deviation is greater than 5% of the means, re-do the measurement of the sample just tested.

9. Reporting

Report the average values of the replicate measurement to the nearest 1°C for temperature and to three significant digits for specific conductance.

APPENDIX B

COLLECTION OF WATER SAMPLES FROM RESIDENTIAL WATER SUPPLIES

COLLECTION OF WATER SAMPLES FROM RESIDENTIAL WATER SUPPLIES

1.0 INTRODUCTION

This procedure shall be used to collect samples from existing residential water supplies for all non-microbiological analyses. The primary objective of this technique is to collect a sample representative of the groundwater supply and not water standing in the delivery system or well casing.

In a nonpumped well, there will be little or no vertical mixing of the water, and stratification may occur. Water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. Stagnant water may contain foreign material inadvertently or deliberately introduced from the surface, resulting in nonrepresentative data and misleading interpretations.

In most cases, groundwater samples from existing residential water supplies are obtained from taps or spigots on the existing delivery system. The installation of a new tap for sampling purposes is not usually warranted. Samples should be collected from the tap closest to the well as practical and upstream of any filtration or water treatment device.

Two separate operational steps are required to obtain a representative sample.

- o presampling system purging, followed by
- o sample collection